

# AVIATION WEEK

A MCGRAW-HILL PUBLICATION

NOV. 5, 1951

50 CENTS



## WHY PANTHERS PULL NO PUNCHES

Over the foaming wake of its carrier, one of our Navy's most aggressive fighters, the GRUMMAN PANTHER, comes in low for landing. Since early in the Korean War, PANTHERS have demonstrated two traditional Grumman characteristics. The ability to hit hard and the ruggedness to take punishment and return "home."

GRUMMAN AIRCRAFT ENGINEERING CORPORATION, BETHPAGE, LA

Contractors to the Armed Forces



FIRST ON CONSOLIDATED'S B-36



NEXT ON THE NEW MARTIN P5M-1



SOON...

INTEGRAL PART OF NEW WESTINGHOUSE J-40



### Proved reliability increases acceptance of Sundstrand Alternator Drive!

Truth of the old French proverb "Nothing succeeds like success" is once again proved by the rapidly increasing acceptance of Sundstrand's Constant Speed

Alternator Drive. On the B-36, more than 6500 hours of trouble-free operation have been logged. Test runs of Martin's new P5M-1 further verify its dependability. And now it is to become an integral part of the new J-40 engine. Other applications are "in the works," utilizing Sundstrand's reliable research, expert engineering, and proven production.

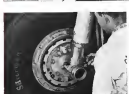


**SUNDSTRAND  
AIRCRAFT  
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MINNEAPOLIS MACHINE TOOL CO.  
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AIRCRAFT AND INDUSTRIAL HYDRAULIC TRANSMISSIONS, PUMPS, MOTORS, AND VALVES • GAS BEARING PUMPS • AIR SAMPLERS  
(AERIAL • MILLING, DRILLING AND SPECIAL MACHINERY) • DRILLING TOOLS • MACHINIST COCKETS

# B.F. Goodrich



## 5,000 landings per lining reported with B. F. Goodrich brakes

WEST COAST AIRLINES' fleet of DC-7s has so many short flights that landings have to be made every 20 minutes on the average. Maintenance costs were extremely high because the brakes they were using gave out too few landings per lining. What's there some way to make this cost?

Their engineers had heard of B. F. Goodrich Expander Tube Brakes. They decided to change over all their planes. Now they are able to report over 5000 landings per lining. Maintenance costs have been reduced 60%. Savings so West Coast have far more than made up for the initial cost of the changeover.

One reason why B. F. Goodrich Expander Tube brakes last longer is because the braking action covers a full circle, wear is spread more evenly. The design of the brake gets rid of hot spots, adding to the life of the pads. Resistor spring action eliminates wear due to rimp.

Simple design of the brake makes maintenance easier, reducing in-shop time. Only tools needed to replace it are a screwdriver and pliers. Because the expander tube applies pressure directly to the brake blocks, extra parts and linkages are eliminated.

There are other advantages Expander

Tube brakes can be designed lighter for a given amount of kinetic energy than any other brake.

They cannot lock or grab. They respond more sensibly to pressure. They can take heavy overloads better in emergencies. Another product of B. F. Goodrich research and engineering, the Expander Tube brake can be designed into any type of plane, large or small. Write: The B. F. Goodrich Co., Aeronautical Division, Akron, Ohio.

**B.F. Goodrich**  
FIRST IN RUBBER





*Are you taking full advantage of the constantly growing range of forgings?*

Typical is this aluminum alloy forging with a projected area of more than 1,000 square inches used in the wing structure of a modern military bomber. Such forgings are today made possible by the use of the largest die forging press in America (18,000 tons). For hammer or press die forgings of aluminum, magnesium or steel, Wyman-Gordon engineers are ready to serve you—there is no substitute for Wyman-Gordon experience.

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FORGINGS OF ALUMINUM • MAGNESIUM • STEEL  
WORCESTER, MASSACHUSETTS  
HARVEY, ILLINOIS      DETROIT, MICHIGAN

## NEWS DIGEST

### DOMESTIC

Dr. Jerome Clark Henshaw, for his year chairman of the National Advisory Committee for Aeronautics, will receive the 1951 Wright Brothers Memorial Trophy at the Aero Club of Washington's annual Wright Dinner, Dec. 11, on the 40th anniversary of the first Wright flight. The award is for "significant public service of enduring value to aviation." Dr. Henshaw is on the Board of Directors of the McGraw-Hill Publishing Co. and was an editorial consultant to *Airweek* magazine during its first months of publication.

John T. Mansueti, 51, president of the Besser Corp., Newark, N. J., died Oct. 26 in Johns Hopkins Hospital, Baltimore. Mansueti founded the firm in 1925 and had been its president for five years.

Scheduled deliveries have been granted GAB permission to continue inventory stock service for an additional 90 days beyond Dec. 31, during which period they will exit. The extension will permit GAB to complete review for the purpose of formulating a long-range policy on its tools.

Donald Nease, chairman of the Civil Aeronautics Board, has been named chairman of the Inter-Agency Air Coordinating Committee. He controls Commerce Undersecretary Robert Rostad in the post.

National Air Council's annual awards for outstanding aviation research and development were presented to Capt. Walter S. Doolittle, recently with Boeing, and Maj. John P. Stapp, USAF. Doolittle was cited for contributions in the field of supersonic flight. Stapp for his studies of deceleration's effect on human beings.

Personal and executive plane shipments, mostly for planes, during September, came in 158 planes of various types with a total dollar value of \$2,627,045, or 16.6 per cent. There were 120 four-place or more, 59 two-place, and 1 single-seater.

Herman International Trophy for the outstanding aviation test of 1950 was presented to Col. David C. Schilling, USAF, for the first rocket jet flight across the Atlantic, in a Republic P-84.

Worked-out aircraft quality standards will be awarded exclusively for its credit, model available and without charge program after Jan. 1 by order of National Protective Authority.

After that date, all orders for these aircraft must be certified under Schedule 1 in NPA Order 336A to insure their use in such programs.

Major B-47 modification contract has been awarded Grand Central Aircraft Co., Glendale, Calif., by USAF. Features and equipment developed after the Strategic have left the production line will be added by Grand Central. Some of the planes will be modified in engine, control and C. C. Mustang, board classroom, although USAF and Boeing deny such a modification.

### FINANCIAL

Chicago & Southern Air Lines has declared a 40-cent dividend on its common stock, payable Dec. 3, to holders of record on Nov. 23, making a total of 85 cents per share paid this year.

Republic Aviation Corp. reports a net income of \$2,141,407 for the nine-month ended Sept. 30, 1950, for the year. Sales for the period were \$81,007,697. As of Sept. 30, Republic's backlog was over \$510 million.

Phoenix Air Lines net income after income taxes for the first nine months of 1951 was \$1,419,252 out of revenue of \$20,137,862. Net income in the third quarter was \$768,238 after taxes.

American Airlines reports net income of \$9,621,200 or \$1.35 a share for the nine months ended Sept. 30, compared with \$8,810,511 or 77 cents a share a year ago. This is after federal income tax of \$15,763,008, yielding \$2,415,000, or 33 cents profit tax.

### INTERNATIONAL

Canadian Government contracts for aircraft spares, repairs and hangar repairs for the RCAF during Aug. 26-Sept. 13 totaled \$1,445,365.

Air Chief Marshal Sir Alan Conry, head of general aircraft development for the British Ministry of Supply, will join the Bristol Aeroplane Co. Ltd., soon as managing director of the engine division.

IAEA Clearing House transactions from January through August, 1951, totaled \$395,014,000 in comparison with \$99,355,000 for the same period last year. August clearance was \$18,945,000. Of this, the month of April this year 50% was utilized through offsetting credits and debit balances.

## 500 LB.-IN. POCKET-SIZED ANGEL Gear



*Photographed inside chassis shafts to show size and compact design*

The Model R-500-X high strength, compact ANGEL gear is now available in hardened steel; loads up to 500 lb.-in. For applications where the standard model R-500 web 250 lb.-in. is not strong enough, the R-500-X is the answer. It is especially suited for manual operation of remotely located valves or controls which may develop high break-away torques.

Both the R-500 and the R-500-X are used for transmission of 1/2 hp at 5,000 rpm. All models are fabricated for life and made with heat-treated gear, hardened bearings, three-bolt side and flanged end mountings with universal joints.

See IAS Aeronautical Catalog for Dimensions

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ACCESSORIES CORPORATION

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Millsville, N. J.

LOS ANGELES, CALIFORNIA • DALLAS, TEXAS  
TORONTO, CANADA

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<sup>12</sup> "... THE FIRST AIRCRAFT IN THE WORLD TO HAVE FLOWN PISTON POWERED, JET POWERED, OR AS A GLIDER ... " (AVIATION WEEK MAGAZINE APRIL 30, 1951)



**Note:** 6-6-Synonyms on the Flowers and Medicines of the Upper Atmosphere, sponsored by AF Schold of American Medico and the Lovelace Foundation for Medical Education and Research, Plaza Hotel, San Antonio, Texas.

New, 7-Annual Wings Club Duesy. Web.  
And Antora, New York.

**Nies, S-B-Seventh annual national conference on industrial hygienists, sponsored by the graduate school of Hygiene School of Technology and America Research.**

Nov. 15-16—Seventh annual meeting of The Magnesian Assoc., Edgewater Hotel, New York.

Nov. 16—Annual business meeting of the American Basket Society, 79 W. 49 St., N. Y. 10, N. Y.

Nov. 17-18—Arctian Distributors and Manufacturers Assoc. meeting, Waldorf-Astoria Hotel, New York.

Nov. 28 14.—National convention of the American Basket Society, Atlantic City, N. J.

Nov. 30-Dec. 5—Meeting of the American Society of Mechanical Engineers, Chalfont Haddon Hall, Atlantic City, N. J. For information write: Ernest Hartson, 40 W. 39 St., N. Y. 18, N. Y.

**Des. 45—**Transport aircraft hydraulic accuracy and system conformer, sponsored by Vickers Incorporated, Elford Sharnon, Elford.

Dec. 6-3—Feedback Controls System, Chas.  
Eaton Haddon Hall, Atlantic City, N. J.

Dec. 15—Wright Brothers Lecture, U. S. Chamber of Commerce Auditorium, Washington, D. C.

Jan. 26, 1932—Annual Meats Air Show,  
sponsored by the Florida Air Pilot Ass.,  
Opa Locka Airport, Florida.

Jan. 18 Feb. 1—20th Annual Meeting, Institute of Anatomical Sciences, Astor Hotel, New York.

Jan. 29-31—314th National Meeting of the American Meteorological Society, Roosevelt Hotel, New York

March 3-4—Institute of Radio Engineers,  
Waldorf Astoria Hotel & Grand Central  
Palace, New York.

**March 27-29—Second Midwestern Conference on Fluid Mechanics**, to be held at Ohio State University.

March 1933—American Society of Tool Engineers, International Amphitheatre, Chicago, Ill.

[illegible]

ANTI-SUB CLASSIFIED—Proud Sea Prince T. Mo. 1 (see 559p) Alvin Lennon (captain) is used to train Royal Navy officers in antisub warfare, even over a box of special equipment. It differs from civil Prince in having larger arm, twin short landing gear

**ANTIRADAR CLASSROOM**—Each SNBHQ's assortment of bulge aimed over radar bulge laser radar countermeasures used in driving courses.



**CHIMPUNE AMERICANIZED**-Experimental Chipmunk virus being tested by de Havilland, Toronto, has Molt-Fray, a Lynx-type O 45 in place of BH Gipsy engine. Note long exhaust stacks.

**FIRST CANUCK JOINS RCAF**—First Aero Command CF180 two-seat all-weather fighter (2 Aero Command) delivered to RCAF is seen below. This, the third CF180 built, will be based at a replacement station at Richfield. It is fitted for Arctic conditions.





P-47 THUNDERBOLT, sleek, clean, requiring less fuel and wing lift speeds for 600 mph USAF fighter leader.

## Yesterday, the Thunderbolt —Today, the Thunderjet!

### PERMACEL® and TEXCEL® Tapes Again Speed Production of Republic Aviation

Here are a few important jobs PERMACEL and TEXCEL Tapes perform to boost Republic's fighter plane production.

**PROTECTING:** PERMACEL 77 Masking Tape and 700 Masking Paper protect Thunderjet fuselages, wings, and radars from minute scratches affecting speed flight.

**MAKING BAD STANDING:** PERMACEL 77 and PERMACEL 750 also make perfect masks and stencils for spray painting U.S. insignia on wings and fuselages for Republic.

**WOUNDING:** PERMACEL Cloth Tapes are used to bandage tears of rough bar and rod stock—making them easily welded, skinned, and hulled.

**MAKING:** TEXCEL Acetate Film Tapes and thousands of replacement parts packages, as well as precision vacuum labels from the electronics.

**POURING AND IRONING:** TEXCEL Cellulose Tape helps with drawing of building, molding, and stalling jobs in the general offices, printing shops, and other departments.

Republic Aviation Corporation is only one example of how PERMACEL and TEXCEL Tapes are helping our government. Our national sales force and special industrial representatives are available to give you prompt service and full assistance on your special tape problem. They will call at your request, or if you prefer, write for descriptive literature. Industrial Tape Corporation, New Brunswick, New Jersey.



## Industrial Tape Corporation

NEW BRUNSWICK, NEW JERSEY

Markets of PERMACEL® and TEXCEL® Pressure Sensitive Tapes for Industry.



## WHO'S WHERE

### In the Front Office

T. A. Boland has been appointed vice president and managing director of Kaiser-Tanco Corp., in charge of maintenance and defense production at Willow Run, Detroit and Dearborn, Mich., and Oakland and Richmond, Calif. Boland joined K.T. in 1946, during World War II, as managing general manager of Kaiser-Bell Aircraft Corp.

Rev. Allen, James D. Bates, USA, ret., has been named a vice president and elected to the board of Commerce Co. of America. He will be the company's representative in Washington, D.C. During World War II he was a carrier commander.

Leslie A. Muehle has been designated to the vice president general manager of Goodrich Aircraft Corp., in charge of personnel and purchasing. Muehle, with Goodrich since 1951, headed all purchasing and sub-contracting in GAC during last war.

Thomas K. Taylor has been promoted to vice president in charge of sales and marketing for TWA. He is the bank's liaison with various government offices.

### Changes

Leslie E. Bowers, chief of plant police team at North American since 1941, has been made manager of the company's Internal Affairs division.

James E. Burt has been promoted to general superintendent in charge of factory operations at Glenn L. Martin Plant 2.

Dr. Gerald J. Shaligh, Cosmos area dynamometer, formerly with Bell's Rapid Aircraft Development's helicopter section, has joined Bell's Research Corp.

W. B. Dined Seattle has been appointed manager of National, Inc.'s Aircraft Division Company at Costa Mesa and San Diego, Calif.

A. G. Rhoadsheadman, vice president of East, Inc., has been designated general manager of the company's Grand Rapids, Mich., division. W. Douglas Berry, also a vice president, has been named chief engineer for the Grand Rapids division, succeeding C. F. White who resigned recently.

G. K. Olin has been made general manager of Lockheed, Inc., Los Angeles, and A. H. Knell has replaced James Wood as vice president of the Grand Rapids plant, and A. H. Lawson has been put in charge of that division's control division, succeeding Dr. Henry Deane, who resigned at that position division office at Tullahoma. J. Michael H. Stewart has been named quality control manager for the firm.

### What They're Doing

Frederick W. Gill and Frederic F. Kaul have been placed to briefly mention and suggest consulting under the name of Michael & Gill, with research offices at 403 Broadway Ave., Tarrytown, N. Y. phone: (914) 444-4444. Gill directed the Naval School of Systems report, Defense Commission, and Knell has been seen as an independent air transport consultant.

## INDUSTRY OBSERVER

►Newest proposal to Air Force for a super-heavy cargo transport calls for a sweeping version of the C-99, with 180,000 lb payload. It is basically a transport counterpart of the sweeping eight- at 3-60 heavy bomber proposal. Alternate eight-engine turboprop and turbogear versions are proposed.

►Key to the increased requirements for GEJ-47 engines in USAF fighters and bombers, is the opening of a General Electric Co. service class at Stouffer Field, Kan., for overhaul and modification of J-47 in addition to the similar and shop already in operation for North American F-100 powerplants at Los Angeles. The Stouffer Field shop will handle engine overhauls from Ft. Worth (F-100), Oklahoma City (T-38 USAF Jet Overhaul Depot) and Tulsa and Wichita (B-47).

►NACA's swirling wing research recently have conducted tests with "super-critical" wings containing the surface suction of the rapid-diffusion water at temperatures as low as -22°C.

►Technical difficulties in development are pushing back the nine-engine 1954 interceptor project of Republic and Convair, so actually it will probably be closer to a 1956 interceptor.

►North American's sweeping proposal for additional production on the four jet B-45 Tornado Bombers is attracting considerable Air Force interest, but Air Force is also studying the new Navy Douglas A-10 carrier bomber for essentially the same use. One or the other is likely to be topped for a production order.

►Hamilton Standard has offered two turboprop proposals for evaluation on the forthcoming Convair T-29 interceptor trainer and Curtiss Propeller-driven also a bid to select test designs, signaling the end to a virtual "incubator" which Aeroquip division, General Motors Corp., has held on prop for Allison T-58 engines. Meanwhile Aeroquip and its interested in getting some of its propellers tested on the new Pratt & Whitney T-34 turboprop engine, which then for has remained a Hamilton Standard "exclusive."

►Pacific Airmotive Corp. manufacturers service program for experimental high speed aircraft at Edwards AFB, Calif., one of the most serious commercial field base operation in the country, has provided servicing on such old craft as the McDonnell XF-85 prototype fighter and the Bell X-5 variable sweep research plane as well as McDonnell's XF-108 Voodoo fighter and Republic's XF-92 and XF-96 jets. PAC provides maintenance and engineering specialists, and materials, from its service Republic headquarters.

►Boeing Aircraft Corp. reported deliveries of 25 Twin-Beechcraft planes to Canada, as of Sept. 10.

►Navy is installing a new safety device on its jet personnel after a new accident in a jet fighter of the Carrier Force from the Honolulu water front last month. Systems will jet into battlefields weighing 70 lb. space was accidentally dropped prematurely in a salvo which caused personnel to be injured in several different ways and acting more from inertia, but did little if any actual damage. The new safety arrangement will prevent a repetition of such an accident, a Navy spokesman said.

►North American's new F-108 jet fighter to be built at Los Angeles is designed for ground support and low level attacking operations.

►USAF and Navy planes have flown more than 100,000 sorties since the start of the Korean war, June 25, 1950. Official Defense Dept. tally as of Sept. 30, 1951, shows for AF: 233 kills, 64 probable, and 215 damaged enemy aircraft; for Navy-Marines: 50 kills. USAF's tally include 99 MIG kills, 35 probables and 153 damaged.

## Washington Roundup

## 'Atomizing' the Armed Services

Large-scale abolition of "dozens of varieties" of atomic weapons by the armed services is thus not off, although they are being discussed in amiable "sims."

It will take that long to count down the billions for new production. The cost: about \$5 billion a year, or approximately \$15 billion total. Only \$1 billion a year new goes into the atomic program.

Congress' Joint Atomic Energy Committee is prodding the military to move forward about with the program. The group has directed the Department of Defense, in collaboration with Atomic Energy Commission, to submit by Jan. 3.

A defense and concrete report on minimizing the role which atomic energy can and should play in the defense.

The big question: Will an "atomized" defense establishment meet its end?

Atomic Energy Committee's chairman, Sen. Boris M. Mahan, reaches the happy conclusion it will cut the defense bill by some \$10 to \$40 billion a year, after the huge investment in productive capacity during the next few years.

He claims that instead of the present prospect of a \$500-\$550-billion-a-year defense outlay over the coming years, the U.S. could have increased striking force for some \$10 to \$40 billion a year "with an atomic Army, atomic Navy, and an atomic Air Force."

But military men don't agree.

•Mahan agrees. The U.S. now spends \$4 billion a year for conventional firepower, from small arms to bombs. If this amount were redirected into atomic weapons, the size of the services-in-suspense, fleets of ships and aircraft—could be maintained.

•Military men, though, point out that military size is determined by enemies.

One USAF spokesman comments: "A plot and our plans would be ruined if a bomb could have brought about 'atomization' to last against the enemy in Korea when all the ammunition and bombs we've used over there added together, but this strategy would not have effectively destroyed the enemy and thrown back his lines."

One who points that military size is determined by enemies from atomic weapons will not reduce the need for nuclear "in its use."

"They do agree with Mahan that atomic arms would threaten a new low that has been \$100-\$150 billion only for atomic facilities will mean cuts in bombs and will draw on materials and technical personnel needed for planes and other real needs to increase military strength now—not five years from now."

## Airmail Separation

"The defense agency against the 'atomization' setting of mail rates is proposed by the Johnson bill, and now must be delivered by CAA after consideration of individual operating factors."

But six large regional carriers and two local lines would feel the better under the rates proposed in the Johnson separation bill, notably raised by the Senate and now revised. Hence action, then under the rates fixed by CAA without consideration to individual factors.

•Regional carriers, down for only \$15 cents a ton mile by CAA, would get a 60-cent rate. "They are small, Cops

no, Chicago & Southern, Delta, National and Western. •Local lines, allowed \$1.48 a ton mile by the Board, would get \$1.50. They are: Air American, Bonanza, Empire, Frontier, Trans-Texas, West Coast, Wisconsin Central, Lake Central, Orem, Southern.

But some of the local would not make out as well under the Johnson bill, which allows them \$1.50 a ton mile, as under the CAA decision. The Board allowed Central \$2.55, and Mid West and Western \$7.16.

CAA rates for other carriers approximate the proposals of the Johnson bill.

## Ceiling on Generals

Although USAF is now the major source of defense, Joint Atomic Energy Committee has set a ceiling of \$15 on the number of USAF generals, while allowing Army 495. The ceiling on admirals is 193.

USAF now has 316 general officers: Army, 495 and Navy, 266 admirals.

Not peak of World War II, AAF had 320 generals. Navy 555 admirals and the Army 1,000 generals.

## Here and There

•International Currents—Sen. Pat McCarran will try for action early next year on legislation authorizing payment of continuous differential subsidies to international carriers. He introduced a new version of the measure before Congress adopted it. Its leader in the industry, Pan American Airways, U.S. manufacturers claim that because of greater technological efficiency their planes are actually less, not more, than the foreign competitor—despite foreign companies' lower wage costs.

•Kneppelstein-Wahl, a \$1 million appropriation, the new Independent Reconstruction Bank, headed by former Assistant Secretary of Navy John Kneppelstein, is ready for business. It will take on the question of as well as policy aspects of immigration. One of the major questions for the Board, which contract is to be subject to acceptance?

The law gives wide latitude, providing that not only military equipment, but contracts awarded to the defense program be open to investigation.

•Wright Patterson Investigation—Investigators have been at the government center for "atomic time." Sen. Lyndon Johnson's Preparedness Committee expects to make report on procurement practices and "other aspects" around the beginning of the year.

•Aircraft Profile—A comparative study by Sen. Johnson's group, at points in lacking industry over the past ten years, based on sales and investment is about half completed.

•Support for Nucleonics—Sen. Wayne Morse and Dennis Chavez have joined Sen. John Sparkman's congressional drive for the nucleonics. The staff of the Senate Small Business Committee, which Sparkman leads, will keep an eye on CAA actions in nucleonics during the year.

Chavez put the Board on notice: "Now that Congress is authorizing, what industry is there that the next few months will not see continuation of this process of 'atomization' by regulation?" It, during the intervening months, industry would independently get out of business. I think this would be an act of bad faith on the part of CAA toward the Congress."

—Katherine Johnson

## Swiss Arms Firm Invades U.S. Market

- American subsidiary of Oerlikon, headed by Lt. Gen. K. B. Wolfe, eyes explosives and missiles first.
- But manufacture of machine tools, electronics, and especially aircraft armament, is planned.
- It adds up to an integrated research, development and production company along European lines.

By Ben S. Lee

U.S. aircraft and munitions industries are faced with a new kind of competition by a Swiss firm steeped in the Old World traditions of great armament companies acting impartially to governments as private and war throughout the world.

Oerlikon Tool and Arm Co., of Zurich, Switzerland, subsidiary of the Swiss Army Arms Corp., formerly well known as a manufacturer of a major explosive powder facility in the U.S. which also will handle the dual role of tool assembly plant for various munitions weapons.

Headed by retired Lt. Gen. K. B. Wolfe, former USAF deputy chief of staff for munitions, the American firm will establish an integrated munitions research, development and manufacturing firm designed to give the U.S. an arms industry on a par with such European firms as Saab, Kongsberg, Bofors, and Hispano-Suiza.

The company also will introduce a complete line of conventional arms, including machine tools, electronic and electronic equipment such as electronics and other munitions supplies. Most of its conventional tools, with the exception of machine tools, likely will be sold "on the future shelf" during the defense expansion.

•Foreign Disposal—Oerlikon-America eventually will produce U.S.-manufactured armament, according to Wolfe, but during the initial buildup probably will manufacture a considerable number of weapons under Swiss license.

Based in the same manner, Wolfe said, as Pratt & Whitney is producing the British Nene (J-47) and Turboprop (J-48) jet engines under license.

This nation, Wolfe declared, in past major military operations has used more armament items of foreign design and origin. During World War II, he said, some 300,000 Oerlikon 20mm anti-aircraft guns were built for use by

the United States and for its allies.

This was in addition to a considerable quantity of Bofors and Hispano-Suiza guns similarly manufactured in the U.S.

The United States in early World War II began development of munitions assembly systems—turrets, computerized, gunnery, etc. These developments were the responsibility of the Bureau of Aeronautics and the Air Corps of the U.S. Army. Great and successful for the firing services, so the other hand, was the responsibility of the Bureau of Ordnance, Navy, and the Chief of Ordnance, Army.

•Family of Arms—This development is still largely sponsored by the military and not by industry.

Early in 1946, E. G. Bofors, president of Oerlikon-Suitzerland, decided the company would develop a family of weapons—machine tools, gunnery, aircraft and air control equipment.

This was done directly with company heads drawn from groups of conventional arms as well as from munitions shops. (Examples of the latter are currently shown at a Zurich fair and reported in Aviation Week Sept. 17, p. 35.)

In contrast to American industry's dependence upon complex government

appropriation which control development and expansion of munitions in research and manufacture, Oerlikon aims upon commercial endeavor to support its present field of arms development, in peace time, Wolfe said.

A considerable but unindicated capital investment in the United States already is proposed by Oerlikon to establish the American company. The integrated munitions complex planned by Oerlikon requires extensive manufacturing and test facilities, powder plants, firing ranges, laboratories, etc.

•To Train Personnel—Oerlikon is late in getting into the U.S. defense production program, it will concentrate temporarily upon final assembly of munitions from subassemblies. So far it has completed technical arrangements with some U.S. subcontractors to manufacture of component parts of weapons for the military service.

Production technique during initial plant operation will be guided by Swiss experts who will train American personnel in Oerlikon research and manufacture methods.

Eventually the American company will be controlled and operated completely by U.S. personnel.

Oerlikon projects early production of a family of munitions designed solely for munitions use. Headquarters U.S. aircraft munitions group have been largely in the field of gunnery and aircraft use. But increasingly high speeds of present day munitions plants are proving these weapons inadequate.

•Tool Shortage—Oerlikon, according to Wolfe, will be diversified in the United States primarily as a designer and manufacturer of aircraft armament, since its Swiss counterpart has been previously internationally known for its machine tool equipment for ground and

## This Is Oerlikon of Switzerland

•Sited behind the swiftness of "Oerlikon Machine and Tool Works, Bockle & Co.," and a world-wide reputation as a manufacturer of machine tools, the Oerlikon establishment of Zurich, Switzerland, is better known in the war industries of the world as a purveyor of air armament. . . . Not worth \$15 million, owned by U.S. standards, but huge in a small country. . . . Founded in 1853 at Oerlikon, Switzerland, a Zurich suburb later incorporated into Zurich.

Began as group of small manufacturing companies, brought together in 1924 by E. G. Bofors into Oerlikon Tool and Arm Co. . . . Has several companies in Switzerland, Italy and India, and ties with machine tool manufacturers in Germany. . . . Manufactures 40 different products.





## What Tory Win Means to British Air Power

British aircraft design genius, typified by such new design ideas as the Hawker P.1067 sweeping interceptor and the Vickers Valiant four-jet bomber, has always been bright. But British production, at Aviation Week has reported, suffers from shortages in labor, materials, housing, and—perhaps above all—money. Will a change in government now change this? David Huxford, Nuffield McKinnell, McGraw-Hill "World News" correspondent in London, gives a preliminary estimate of the election's effect on British air power.

London-Britain's aircraft manufacturers, along with virtually all of British industry, observed the return of a Tory government last week, and held high hopes that the industry stood to gain quickly from the results.

Unlike across British industries, the plane makers have reason to expect a change in fortunes. The Tories, much more than the Laborites, are likely to do something about putting Britain's manufacturing program back on schedule. The industry has been badly closed down by labor shortages and indefinite production schedules.

► **New Transporters:** The Tories' chief air spokesman, Air Commodore Vase Hurry, who was recently named a director of Hawley Page, has indicated he will continue his campaign to lessen Britain's air dependence on the U. S. One of Hurry's big battles has been the RAF's depleted transport command.

The RAF today hasn't got a plane capable of carrying heavy military equipment. The Labor government was holding out for Fairchild C-119s, or failing that, C-47s, from the U. S., under the arms aid program. Air Cdr. Hurry has an opportunity in the last parliament to press for production of a British type. Now, chances are, weapons will be placed.

Blackburn & Gouzen's GAL-68 fighter is likely to be the

first choice. Bristol Aeroplane's Lightning, already ordered by the RCAF, may also get a slice of the pie. A military jet transport, possibly a modified Comet, is also in the design stage, but it is doubtful that Comet production will be diverted to this role as war becomes much more likely.

Air Cdr. Hurry was also a champion of a British strategic bomber team about a year ago. With the development of four bomber prototypes, the Vickers Valiant, Short Bros. SA-4, and two others still under serious study, this argument hasn't been pushed lately. But only more than 20 Valiants and no other new bombers have been ordered so far. The Tories in a step up this program, too.

In the civil field, there has been a lot of pressure from Tory quarters to decentralize some of BAC's and BOAC's production inside England and to the Continent. But little, if anything, is likely to be done about this at this time. The international market is just beginning to settle down. Another criticism from the politicians might concern the trend and it isn't likely that the Tories will risk it. Besides, it might be many years before the present government could find time to tackle such a problem.

► **Housing Problem:**—Housing built to the industry will be a low priority. The plan is to build 30 aircraft

plants. The Tories have pledged themselves to build 300,000 houses a year. The target is probably too high, but if the effort exists alone, cutting of production on which houses can be built, aircraft manufacturing should flourish. Many aircraft plants in England are in various stages with relatively low priorities for the deep new housing program.

Now, too, aircraft plant managers fight for mass defense plant facilities. Ministry of Supply officials have been getting under the hood. Letters of intent for some 200 places—the Vickers Supermarine Swift for one—still haven't been issued. New producers, even though the RAF stepped up the plan for drawing board designs.

► **Money Problem:**—The Tories will feel spending money on airplanes more palatable than Labor did but faced with a tight financial and materials squeeze in Britain has had since the war, the new government is still going to be in a strong bind.

Tory leaders, as well as Laborites, claim that they cannot finance even their present three-year, \$17.1 billion commitment program without some help from the U. S. The decision is simple. The government in any British government today to keep defense spending as low as possible in terms of the money in the country's stockpile of living is looking like that in the U. S.

can go as high as \$675 on DC-1s to \$795 on Stratocruisers, compared with previous highs of \$575 and \$600.

The 14-months retrospective clause is equivalent to \$120 a month but has every pilot for periods ranging from 10-12 months for captains to 21 months for co-pilots.

Contractors also have things benefits the pay of half the flight time cost for doing—

United now has over 1,000 pilots flying about 170,000 miles a day with 10,000 passengers, 100,000 lb mail and 130,000 lb cargo.

## AF Yields on Army Plane Weight

Procurement limits are listed; ground forces will press for increased numbers of heavier aircraft.

The hotly contested debate over weight limitations imposed on Army air procurement in kind and money-weight limits has been ended by agreement between USAF Secretary Thomas K. Finletter and Army Secretary Frank Pace, the Air Force has decided to abandon weight

restrictions barring Army from some procurement of land-weight aircraft weighing more than 2,500 lb and rotary-wing aircraft weighing more than 3,000 lb are now removed. These restrictions are covered in joint Army Air Force regulations dated May 25, 1919 and are numbered AFH 9-17 and AR 700-58.

Previously the agreement for cancellation in its own weight limits has only been a matter of time. Presently what types and how many and for what purposes Army may procure aircraft regardless of weight is now under study by both of the services. ► **Specified:**—The Air Force and the Army stated "Army and Air Force are in agreement that specific weight limitations on Army aircraft as outlined in existing regulations are so largely governing and that performance of functions is the paramount consideration."

"In view of this fact, Air Force is currently pursuing liaison and help center service for Army use, which are known to Army personnel. This action has been taken with the cooperation of civilian and military leaders of both departments."

"A recommendation of understanding has been done up between Mr. Finletter and Mr. Pace and to now being and as a least for staff agencies of both services to prepare the necessary revised joint regulations."

► **Army Interest:**—The service is so intent to interpret specifically what the Finletter-Pace agreement means to Army air procurement and it is officially influenced by regulation. But Army probably still is to be prohibited from some procurement of aircraft which would infringe upon USAF roles and missions.

That Army will press for increased numbers of heavier aircraft and for passenger transports, however, is evident by its continued interest in light personnel and assault transports and heavy helicopters.

► **Light Transport:** Army has already procured a number of Cessna 440s from Hawland-Bussard through a previous series of weight limitations and so gradually will order more. It has also been authorized a large share of the Bush-Turner-Bossman recently ordered by USAF for utility purposes and has under an intent of the fact that it would like to have a considerable number of the recently USAF ordered Beech T-36 multi-place transport trainers.

► **Assault Transport:** Army has previously asked Air Force for authorization of USAF's rebuilding of portions of only the medium C-47 assault trans-

port instead of progressing production of both the medium and the C-121 light assault transport. Air Force had turned down Army proposals for procurement of both because of funds and ability of purpose of the C-121 with possible acquisitions of the Air Force.

So successful has the light assault transport proved, however, in terms by Army and Air Force that there is some serious consideration being given to establishment of light assault transport companies along with Army's already established helicopter companies.

► **Helicopters:** Long in advance of the helicopter as transport and liaison aircraft in combat, Army is not yet to be interested in its strategy as recently all weight classes of helicopters from 100 to 10,000 lb. It has long eyed Marine Corps development of helicopter as assault transport for amphibious operations and it is now to press for heavier models by Army and Air Force in this field in any of their future plans.

Battle for establishment of a "small" Army Air Corps to maintain resources for Army needs began shortly after Air Force took autonomy in 1947. Army pointed to need for some air force of its own just as Navy found need of a Fleet Logistics Air Wing separate from the Air Force's Military Air Transport Service.

## Temco Speeds C-54s

Temco gave Air Force delivery test the speed of base of the first C-54 to be ordered by the military at the new Mojave Field Overhaul Base, Greenville, Tex.

### ROCKETCOPTER

This experimental project, developed by the Office of Naval Research by Rohr-Craft Corp., is a "rocket" helicopter designed for dropping rescue troops or cargo behind enemy lines. Ground team at the "jump-off," as it is called by its maker, was begun recently at a military base in the Los Angeles area. The two small rotor blades are powered by mounted liquid-fuel rockets which are used in both takeoff and landing. The rotor blades are not so far from being operational, says Rohr-Craft. The rotor is attached to a steel tube which also carries the fuel tanks, pilot's seat and a cargo hook. A small valve is opened on another tube to the rotor hub. The control control system controls movement from the rotor hub. The rotor drive shaft is less than 100 ft. For quiet descent, powered rotor can be retracted. Make of the two rotor sections has not been designed. Performance of the rotor would have to be sufficient to lift at least one man and half the weight of the engine system, with full complement for enough to sustain a reasonable descent range.



## Level Mileage Pay In UAL-Pilot Pact

Captain Lee Lewis and six pilots have signed a wage contract with pilots up to \$300 more a month, senior pilots up to \$131 more, all retroactive to 14 months ago. The settlement comes after two years of bargaining and an 11-day strike in June.

It does not have any of the mileage determination features included in the signed pilot contracts signed lately by Capital, TWA and others. UAL Pilot

dent W. A. Patterson is, at least, against including that principle.

Under the new contract, UAL will pay an extra 10 cents a mile on top of base pay, plus weight pay and landing pay. UAL's straight 14 cents a mile dollar from the mileage formulae agreed to by most other airlines this year, which calls for a rising rate.

Under the new contract, first pilots can make up to a maximum of \$1,251 on DC-1s or \$1,512 a month on Stratocruisers compared with previous top possible pay of \$912 on DC-1s and \$1,311 on Stratocruisers. Copilot pay



**SAAB** plant at Linköping, Sweden, shows here how turning out 320 propeller fighters (Swedish built B31 Glom expander) seems to make full use of available space.

## Down the Line—Here and Abroad



**SIKORSKY** S-10s for Navy, USAF, Marines take shape on the company's Bagleyport, Conn., line. Bagley's facilities make it easier to handle engines.

**LOCKHEED** Super Corsairs being powered up. Much long lead assembly line at Burbank, Calif. Five of 58 Super Corsairs are shown being built.



**FAIRCHILD** Product de highlighted in these two designs taken on the assembly line. Production makes in the left photo is in stilling but on ducts in a red house, part of the plant's anti-icing system. In right photo, a C-119 takes shape as engine section near completion. Next step will be to attach anti-icing panels and tail boom.



## Have Helped Make Aviation History



At the end of World War I, aviation faced a critical situation. Production of high octane aircraft fuels had made possible higher compression engines with greater power output and improved fuel economy. But—these advancements seemed destined to failure for want of sodium valves which could take the punishment imposed by higher compressions, lower moisture, and higher engine speeds.

Engineers in many countries were experimenting with so-called "self-sealing" valves. The first to be successful was an engineer at McCook Field. In 1922 he conceived the idea of a hollow valve partly filled with sodium and potassium salts. In operation the salts liquefied and splashed from one part of the valve to another, picking up heat from the valve head and transferring it to the stem, where it was dissipated into the guide, cylinder head, and cooling system.

This organization took over the development and perfecting of the idea, as well as solving the many production problems involved in forging and machining the highly precise internal cavity. Malleable sodium later proved superior to the salts originally used, and this type of valve became known as the Sodium Cooled Valve.

Sodium-cooled valves permitted the building of engines with previously undreamed of power. By the beginning of World War II, they were used in all aircraft engines of 500 or more horsepower. Sodium-cooled valves have literally made possible the modern supercharging aircraft engines; they have been one of the most important single

factors in the development of commercial and military aviation.

Eaton has been privileged to work in close cooperation with the aircraft industry in developing many other advancements, and in furnishing such vital parts and equipment as valves, valve seat inserts, hydraulic valve lifters, tappets, coil springs, dynamometers, and turbo-charger parts.

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## NOW in Production



Collins 51V Slide Slope Receiver

The design of the Collins 51V-1 receiver, now on the assembly line, is based on "Glide Slope Receiver Characteristics" issued by Aero-nautical Radio, Inc.

This receiver, together with the Collins 51K navigation equipment, will fulfill ILS receiving requirements for commercial and private as well as military aircraft.

The 51V is designed for reception of 50/150 cps tone modulated glide slope signals on all two percent and ten glides channels in the UHF range of 329-335 mcps/cycle. It utilizes crystals identical with those supplied in R-50B receivers and is electrically and mechanically

interchangeable with modified ten channel R-50B's, greatly simplifying installation in passenger aircraft.

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## PRODUCTION ENGINEERING



FIVE AIR FORCES will take delivery on three Chaperon transport and Vampire jet fighter from de Havilland, which also produces the . . .



COMET, world's first jet-propelled transport, shown cruising high above cloud level. Later models mount Avon engines for sustained single

## British Build Planes at 'Reasonable Rate'

Industry ready to roll if it can get dollars, tools; huge Britannia transport may be U. S. competition.

By David A. Anderson

London—The factories that turned out thousands of Spitfires and Lancaster, Hellcats and Mustangs during the war are beginning to stir again. A new breed of aircraft is about to go into production in locations all over England, to be the replacements for the vet-

eran Vampire, Meteor and Lancaster. And entering lines are still producing—with variations—the basic few aircraft that Britain's military needs that entered in the postwar years. ▶ **Cross Section**—After the Farnborough display, sponsored by the Society of British Aircraft Constructors, I visited four defense manufacturers whose

products seemed to represent a fair cross-section of the British industry. Their aircraft included military and civil types powered by the complete current range of engines and carrying from one to 160 persons.

A previous report described the Aerospace division of the de Havilland Aircraft Co. and the Supermarine division of Vickers-Armstrongs (Armstrong Works, Oct 29, p. 21).

The other two plants visited were the extensive plant of de Havilland at

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THIS WAS Dove production, but Comet and Hercules now share the Hatfield floor.

Hatfield, and the airplane works at Bristol Aeroplane Co. at Filton near Bristol.

### De Havilland

The headquarters of the de Havilland Enterprise is at Hatfield, a plant less than 100 miles from London in Hertfordshire. In addition to the small business and administrative offices, the Hatfield plant also possesses a valuable portion of de Havilland's production potential. Engines and propeller test stands, an equipment shop, structure laboratory and de Havilland's technical school are housed around the perimeter of the works.

But Hatfield's chief claim to fame is that it is the home of the Comet and the only production plant for that famous jet-fight transport.

Comet II is a 39- to 41-seat turbojet transport powered by four de Havilland G6 engines, each delivering 1,000 lb. sea level static thrust. Cruising speed is just under 500 mph at altitude above 35,000 ft. Seating arrangement should be noted that this is purely a fiction, because it does not include discussion, head meals, smoking or eating) is over 5,000 sq ft.

Comet II is the same aircraft, but in the context of increased range, the Comet Engines have been replaced by Rolls-Royce Avon 1 turbojets. Each of these engines delivers 6,500 lb. (which is a conservative value) sea level static thrust.

In addition to the Comet Hatfield produces some Vampire jet fighters and is starting to make Hercules four-engine bombers.

There were two major reasons for using de Havilland's plant this year. One was to check Comet progress to compare with a visit in 1950 after the Farnborough show, and is particularly the production floor layout which

features a series of small tracks at right angles for moving components (Automotive Weekly, Aug. 6, 1951, p. 41).

The other reason was to see the development of the Series 2 Comet with Avon engines, primarily to examine the changes which were necessary when the powerplant shift was made.

Disputed Disorder—Regrettably, the first impressions of the Comet production floor was the same as last year's—that the place is a study in confusion. There appears to be no direct or reason for the size planes and component assemblies are spotted around the floor. And the position of the track system was not noted until one of the two coils bolted to the factory floor was seen.

It is the second look that clears up the finding of confusion. There distinctly is a flow pattern: components do arrive at the proper station at the proper time, and here you get used to the idea that the Comet is not on a production line, the rest is easy.

The current production rate of the Comet is better measured in units per year instead of units per month.

This attitude is as it should be because the total quantity of Comets on order does not demand volume production methods. It would be entirely too costly to set up a fast-moving line to bring out great numbers of these planes.

And de Havilland found some necessity in order placed for the Comet, even now, there are some tentative non-estimated made which have not become final. In the office is the changeover to Avon Comets for BOAC. And only recently did BOAC headquarters on the extreme movement of the plane.

None of these factors has been an impediment for BOI to learn.

But from here on, production of the Comets—bearing national designations—should pick up speed. The performance are out of the way, the planes have



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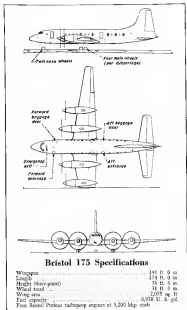
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accommodated a large amount of flight time, the point of takeoff to Area Comets is fixed, the engine is finished and the BAC owner is cleared out of the craft.

► **Area Propose**—The first—and so far, only—Area Comet occupies a large chunk of de Havilland's plant, some which has been temporarily set up as an experimental shop. To all appearances, the Area Comet is just like the Ghost Comet. When the craft was originally laid out, the engine bay was designed to take the larger engines which the de

Havilland design staff felt would be coming along some day. And the outcome was stressed overspeeding.

As a result, the Area engines (which immediately set out much smaller in diameter than the Ghost) fit snugly into the engine bays. No actual Area engine was on the floor, instead DHI crews are working with a pair of beautiful wooden and steel mockups painted silver and blue.

The outcome is nearly complete, and the biggest task remaining is the installation of the Avons. Consequently, first

flight date should not be too far off. De Havilland isn't willing—and they're justified—to give a prospective flight date. A good guess is early 1952.

► **New Nightfighter**—The DH 116, then here, all weather fighter, was announced shortly after the war. It is a logical next step in the evolution of advanced fighter from the basic Vampire layout, and probably will be built in the same plants that supply Vampires to the RAF and a dozen other air forces.

The production order for the DH 116 should have little effect on Comet operations, because placement of the latter probably will be under way before the 116 gets into full production.

So, leaving war in a certain shadow of obscurity and jet engines, the production future of the Comet is clear.

### Bristol

Bristol's Filton works is a huge jodge of ancient and modern buildings on top of a hill, spilling down the slope and onto the plain at the bottom. Inside this mammoth complex, 16,000 can play make as planes, helicopters, or propellers and gas turbine engines—and a small auto stuffing for rough, \$5,700.

The engine works, which employs little more than half the labor staff, are really in producing five types of power plants.

- **Heron** piston engines of two-row, 14-cylinder layout, delivering rated horsepower in the 2,600-hp class.
- **Centaurus** piston engines of two-row, 18-cylinder layout, with intercooler stages in the 3,100-hp category.
- **Thames** turboprop, in a class with the Heron.
- **Pratt & Whitney**, either as a single engine or as a coupled engine, with the former rated at 3,200-hp, in an odd twist, and the latter at 6,400-hp for the same conditions.
- **Olympus** turbojet, reported to be in the 10,000-hp thrust class.

Bristol's overall production is primarily of civil types which is rather surprising in view of the current situation, the space available and people employed there. It is difficult to figure out how so many workers can be productively employed on so few planes. Bristol is building:

- **Balanced**, a twin-engine, Centaurus-powered light bomber for the RAF, now in the closing stages of production.
- **Beacon**, or Type 174, helicopter, a single engine, four-blade job for the bomb and military customers.
- **Bristol** is building 25 of these.
- **Type 175** helicopter, a twin rotor, twin-engine prototype which will cost 12 to 15 percent.
- **Type 470** fighter, powered by two Bristol piston engines and used for

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As wingspan is 140 ft. Four Pratt & Whitney engines power the Britannia. Its design geometric consistency now in service would be Boeing's 314 Superfortress.

Seating capacity varies from 50 to 100, depending on the customer's choice of interior arrangement and on the stage length.

There are lots and pieces of the airplane throughout Britain's shops. Judging by the quantity of components, there are enough parts for about five complete airplanes—but probably few of them will ever fly. Instead, they will become test pieces—ways to be vibrated and broken, techniques to be tested and perfected.

One way was to get an impression of an airplane to get inside and make certain.

In the case of the Britannia, the only available drawings was being assembled, and had no interior fittings. Lacking the real thing, it was next best to construct the mockup, remembering that these temporary structures of wood and cardboard are more strong and stiffer than the final aircraft.

► **Stoney Interior**—The passenger entrance to the Britannia is opposite a main galley which serves as a dividing partition between the forward and aft cabins. One possible arrangement of these cabins would place the passenger or double seats on each side, 12 on the forward cabin and 20 on the aft cabin. With such seating, the plane would not be too crowded, but the figure of 100 passengers would be exceeding it.

Seats are at the extreme end of the fuselage. In the mockup, it has been assumed that the fuselage is inherently stronger than the main fuselage for the men definitely see pressure. And this is important on long hauls like the Atlantic crossing—there is no room for these men to share unobstructed to the Britannia, for one example.

► **Pilot's Position**—The cockpit is a neat layout, but with a single approximation of the real thing. For instance, all the overhead panel with several switches are only drawings, and contain none of the strip-reading toggle that are found in the real cockpit.

As in real plane, getting into the pilot's seat means some body contortion.

First have to be bent carefully just the prism and around to the front of the seat, body bent over and head tilted low.

Once you're in the pilot's seat, things are definitely better. The forward and downward fields of vision are excellent; part overhead engine can be seen easily by turning the head, and the floor part is board by a little torso-twisting. The control yoke is simple and small, affording maximum obstruction to the view of the instrument panel.

One novel installation places a navigation radar scope to the left and slightly



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above the pilot's left knee. Actually it's too low to sit into with comfort, but there aren't any other obvious locations for it.

► **General Assessment**—Although it just isn't possible to assess the overall situation from a meeting and some comparisons scattered over several days, it does appear that the Bf-109 was a conventional airplane, built as a conventional airplane.

Bristol has had enough big plane experience to handle the job with competence.

So the Brits may not be the people to beat on the issue of the Bf-109, but on its current state, the truth shouldn't be any secret to U. S. eyes.

tax and manufacturing alone. When, if there. And it's a credit that if the Brits do not prove out, BOMC's orders will be up Bristol to the point where any other operator would be getting delivery dates instead of 1945.

As for as Bristol is concerned, it appears that the transatlantic plant was available is hardly being used.

The assembly built for the Bf-109 could hold at least two fighter lines without disturbing anything else in there. And Bristol has enough supporting design—engine, detail parts, crating and crating, piece-to take such an expensive effort in its stride.

Bristol is one of the way few British manufacturers apparently has

ing as new military design experience. At least it was the only design firm which did not have a single source of new planes to its credit.

So Bristol's strength would seem to be in its potential production, energy, and in the tremendous possibilities inherent in the private flow rate of the Bf-109's assembly plant.

► **Conclusions**—It is rather dangerous to attempt to draw specific conclusions from a detailed sampling of the British aircraft industry. But some conclusions were made again and again at the plants visited, and many of the speakers added that those views were held throughout the industry.

► **One overall conclusion**: British production of aircraft is at a reasonably safe, considering the handicaps of labor shortages, housing shortages, tool shortages and dollar shortages. With some support from Bristol Defense Assistance Program money (which would furnish machine tools, for example), production could increase substantially without the need for large labor increases. And one conclusion felt that even we are able to get the machines he needed, he would have no trouble building up his labor staff. This was not a general opinion, however.

► **Another overall conclusion** is that the British aircraft people are well aware of their material limitations and are trying to do something about them, instead of just letting things go on in the mold we all "moulding thought."

► **And a third** is that the potential is there, not at all in the beginning of World War II.

That potential, coupled with the "let's not cough" attitude evidenced by the bulk of the industry, is a great asset to the free countries of the world.

## Aircraft Hydraulic

### Parts is Clinic Topic

Safety levels, tubing and fittings for hydraulic systems will be discussed in detail at a transport aircraft assembly and system conference to be held Dec. 4-5 at the Hotel Sheraton, Detroit, on the sponsorship of Vickers, Inc.

Vickers said it is sponsoring the meeting primarily to aid operation in getting more reliability from present hydraulic systems at the lowest cost, and that the theme should be of interest to engineering and service representatives of manufacturers as well as to operators.

Robert R. Stok, assistant to the vice president-engineering, Eastern Air Lines, who headed up the hydraulic program of the Air Transport Assn. conference in April, will act as general chairman of the Detroit meeting.

## The Well Tempered Aircraft—III

# Modification vs. New Design

- As soon as today's military plane is in production, tomorrow's should start on the drawing boards.
- But civil models should be continued, with changes, until they fall behind the curve of progress.

Under the title "The Well Tempered Aircraft," Arthur E. Raymond, vice president engineering, Douglas Aircraft Co., delivered the 10th Wilbur Wright Memorial Lecture before the Royal Aeronautical Society in London Sept. 13. Because it is the most thorough approach to the problem of construction today's aircraft made by a recognized authority, an excellent model in aviation. While at publishing the major portion of Mr. Raymond's paper in *Aviation*, including copies of the original drawings. Two previous installments, Oct. 15 and 22, discussed five of Mr. Raymond's eight fundamental elements essential to production. This final installment covers the other three.

## 6. Thorough Exploitation

A well-conceived, well-executed, and well-developed aircraft can usually be adapted to a wide variety of use over a period of years, thus obtaining its maximum life and long-term use. It is the fact that well-developed aircraft is the last phase, taking into consideration design original design the modifications likely to occur later, not only will these modifications be made easier but it will not be so difficult to make worthwhile major designs which could not be anticipated.

If the foundation has been well-laid, the superstructure can be very satisfactory.

It has been estimated that successful military aircraft undergo on the average, during their useful life, modifications totaling at least half of their original cost. These are major changes introduced into the production line from time to time, either to improve performance of the basic model, or to fit it to a different use.

The second for successful military aircraft is much the same, for these find their way to many different customers, each of which requires variations in interior arrangement or in equipment to meet its own special performance or conditions of operation.

► **Value of Modifications**—There is little use bewailing this tendency toward non-standardization. Modifications undoubtedly add to the cost, but without them the number of aircraft produced would be much less, which in itself would be all likelihood meet the vast cost crisis now.

At any rate, they cannot be avoided and it is the well-tempered belief that it is for the general good that they be encouraged—so that the designer bears every effort to see that every modification that looks at all promising be in-

cluded in the aircraft.

Efforts in this direction are often for more saving than spending in a completely new design. Every new aircraft design represents a heavy investment and a long development time.

► **New Machines**—It is not always apparent to a perspective user that such-and-such an aircraft is just what he needs. Thorough analyses of military aircraft and more studies of civil aircraft help in making out clearly what they can do under various specific conditions. Performance tabulations and flight characteristics are useful, but detail studies cannot put partly by diagrams and appear at the way in which a given aircraft fits into its operation are also needed.

Essentially, the problem is to see first every potential use known that the aircraft can do, what its characteristics are, and what it can do for us in true comparison with other available aircraft.

## 7. Correct Succession

Regardless of how good the aircraft may be, there comes a time, and it may come unexpectedly, when it becomes uneconomical to continue production. Any further modifications will cost more than they bring in. In spite of the best efforts it is better to build the cause of progress to such an extent that to one have make it will only lead to the drying up of sales or will be as serious to competitors to enter the market with something definitely better.

This is the time when a new model should be brought to development phase and ready for operation.

The new model may, therefore, have been started several years before.

It is not enough to acknowledge the past of obsolescence when it occurs; it must be foreseen immediately in advance. The rate at which obsolescence



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one that can never be truly successful because it is so complicated, perhaps the design which seemed to appear at the beginning has faded away under changed conditions. The difficulty here, in many of actual human stubbornness and pride, is to accept the mistake as a mistake, write it off, take a deep breath, and get down to a fresh sheet of paper.

► **Military Angle**—This problem is of consequence, when applied to military aircraft, has some special elements that are worth noting. The losses that a given air force will sustain in battle against the enemy depend, upon its quality. If aircraft are not replaced from time to time with newer models, their

stratagem will be higher in the event of war. Replacement in wartime will then have to be more cautious, allowing more the difficulty of getting them in time, and their total cost will be higher. The added cost will tend to affect the added cost that would have been incurred if more modern aircraft had been secured in the first place.

The possibility of allowing an air force to slip behind the state of the art through failure to renew is so great that a drastic policy of scrapping existing military aircraft and replacing with new ones as soon as they can be made available will pay in the long run.

In other words, as soon as today's bomber or fighter has been placed in production, tomorrow's should be started on the drawing board. In fact, since not all designs are successful, more than one should be started.

The aeronautical war rests on his own too long is overwhelmed by competition, the country that rests on its own too long is overwhelmed by the enemy. There has to be a very definitely established policy of cyclical progression to maintain a place in this world of constant change.

In times past it may have been enough to rely on having new aircraft at all times ready for production. The pace of modern warfare is putting so enormous loads on air forces in being, the new aircraft have to be introduced into production and the old ones retired according to a prescribed plan designed to maintain a high level of quality. . .

## 8. Adaptiveness

Up to this point everything that has been said has given the impression that the production of a successful aircraft is merely a question of following certain rules. Starting with certain ingredients and mixing them in a certain way we get an aircraft result.

Looking back over the example of science and history to the author's intimate knowledge, it is all too apparent that this is far from being the whole story. Things happen which might have been foreseen but were not, things happen that could not possibly have been foreseen. The job of the engineer is to be prepared for happenings which turn out to be the deciding factor.

► **Deficiencies in Planning**—This is an age of planning. It has come about because the very complexity of modern society, government, and technology requires that a great deal of attention be given to planning if things are to be kept under any semblance of control at all. At the same time, some of the problems are so intricate that it is absolutely impossible, at least within the time available, to establish all the variables with accuracy.

The planning must therefore be in-



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perfect and the danger is that you may cause those concerned to lose their confidence and their ability to be fast on their feet in dealing with the unexpected. The following is an apt quotation in this connection: "The absence of an unbiased interest in planning and co-ordination is an essential prerequisite of progress."

Lock—Determination over which one has no control comes in the general category of luck, good and bad. Sometimes plans can be made on an alternative basis when there is uncertainty as to what will happen, but often there is simply no way of anticipating the course of events.

The thing to do in such cases is to be on the alert to seize opportunities, and not to advantage, the favorable happenings and to be prepared to take steps to minimize the effect of unfavorable ones.

There have always been a great many people in the aircraft business whose attitude is optimistic and who expect the best. Many projects never would have been started if this had not been so. A surprisingly large proportion of these have been successful.

The qualities of mind referred to, flexibility, optimism, and lack of caution, are youthful qualities. Aviation will undoubtedly always be a field which attracts young men and men whose is benefited by their presence. Those who have been so it for a good many years may be able to do their part by supplying the impending judgment which only experience can bring, but they cannot allow themselves to think that they have all the answers.

► DC-3 Example—As an illustration of the importance of the engine/propeller element, the case history of a bushing aircraft, the Dakota, is quoted. The specifications for the fuselage of this airplane, the DC-1, was observed in an atmosphere composed of equal parts of optimism and ignorance. It called for an engine which weighed 15,000 lb., that would take off and fly as fast as its two engines (between joints) leaving an elevation of approximately 5,000 ft. with a cruise clearance between 5,000 ft.

When finally completed, the DC-1 was 10% overweight and would never have been able to meet its specifications had it not been for two major and several minor developments which occurred during the course of construction and which were unknown at the time the contract was made.

One of these major developments was the variable pitch propeller and the other was a modified increase in engine horsepower. The DC-1 was able to make the required demonstration flight on one engine (in this connection refer

\*Development of Aircraft Engines, by ROBERTO, a Journal Aircraft School, TORONTO.

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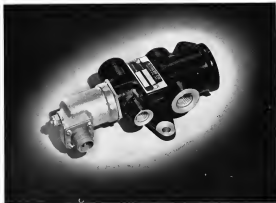
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once might be made in the Wilbur Wright lecture of 1933) and met or exceeded its other performance requirements, but it was not good enough to be put into production without major modifications. It was, in fact, the second attempt by an American manufacturer to build an aircraft of its class and type and handicapped by that fact, but it was still enough of a pioneering effort that by the time it was done it was apparent that it could have been done better.

► Unlabeled Number-Nut size, but two, major modifications were required before the Dakota or DC-3 came into existence. This, it is generally agreed, lay heavy on the scale as a successful aircraft. How successful it was going to become was certainly not known. The tooling was designed for a quantity of 50 planes and it was thought at the time that this was rather daring.

About 730 conventional planes were built from that tooling and duplicates thereof, but these probably would never have been more than 1,000 DC-3s built had it not been for the war, another unknown element in the planning.

At this point two completely new sets of tooling were built and nearly 10,000 military cargo versions were turned out. The results suggested in the early '30s and the last one was built some 13 years later, at which time changes were still being incorporated to increase the service life of parts and to take care of new items of equipment in new uses.

At this point it would have been reasonable, certainly, to have introduced a completely new model, but economic conditions were such that applied a major conversion, the Super DC-4, was introduced, which has carried production up to the present time. The DC-3 was lucky enough in its early years to so completely capture the market (and this was not the result of particularly good planning) that competition was thrown off balance.

If Douglas has had the benefit of a rather unique position, but the fact remains that there exists, unaided by a certain light-hearted acceptance of risk, might well have jeopardized the project in its early stages.

### 9. Conclusion

Perhaps in the entire discussion of the well tempered aircraft has been the idea of compromise between extremes. However easy to state in a principle this is extremely difficult to achieve in practice. It is not enough to bring to bear on these problems a high degree of technical knowledge, nor is it enough to adopt a pragmatic approach.

In the conclusion there is no need, doubt, credited to Dr. Karl Compton, which has come to mind many times through this year.

It seems that a letter of Dr. Com-

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Ex-Cell-O's aircraft parts production facilities are being used now in cooperation with the defense program. If you are working with this program too, perhaps Ex-Cell-O can help you.

ABOVE: Typical precision aircraft parts manufactured by Ex-Cell-O. All details of assembled units were manufactured at Ex-Cell-O to customers' specifications.

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crafts, who lives in India, had occasion to have some wiring done by a native electrician. He came to him over and over again for instructions. Finally he responded to the end, "You know what I want. Why don't you just use your common sense and go ahead?" Where upon he made a grave, costly howl and said, "Madam, common sense is a rare gift of God. I have only a technical education."

It may be argued that common sense is rare, but not that it is entirely a gift of God.

It is something which with great effort and tribulation can be developed. It grows out of experience and the proper blending of many skills and viewpoints. To the extent that those who work in the field of aeronautical science are able to so combine their talents, well-tempered aircraft, as increasing numbers will be created and the great strength they can give to the free nations of the world will multiply.

## Douglas Backlog Tops \$1.335 Billion

With more than 10,000 production and maintenance workers returning to work after striking at Douglas Aircraft Co.'s Long Beach plant, President Donald W. Douglas headed an additional note of cheer for the big West Coast aircraft builder's stockholders. Backlog of unfilled orders exceeding \$1,335 billion and orders totaling \$157,371,814 for the nine months that ended Aug. 31, 1971.

Net income rose to \$5,249,593, or \$4.37 per share for the 1.2 million shares authorized, compared with \$4,708,230 for the same period of fiscal 1970. Higher corporate tax rates lowered percentage of net income to sales to drop to 1.62% from the 4.98% of last year's similar period.

Douglas warned the stockholders the creation of C-124 Globemasters delivered as a result of the work stoppage, which began Sept. 5, would cause a drop in the net sales figure for the fiscal quarter.

The company's backlog, projected at \$1,335,614,865 as of Oct. 1, is broken down 49.5% military and 50.5% commercial business. In the latter category, firm orders for the DC-6A and B have reached 149. Total DC-6 orders totaled 120, exclusive of military models. Douglas working capital was \$52,479,000, down \$14,559,000 from the first nine months of 1970. Because of assumed expenditures for fixed assets the company has arranged commercial loans up to \$50 million at prime interest rates to finance its future commitments for production of aircraft for the Air Force, the Navy and the airlines.

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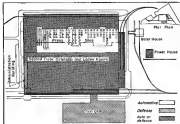
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REPLANTS OR AUTOS—Influenced by built-in layout, similar to those sketched here, which are being built by GM at Willow Springs, Ill., and Arlington, Tex.

## GM Plans New Double-Duty Plants

Flexible set-up could plant auto makers more firmly in aviation, with quick shift possible from cars to planes.

Dr Alexander McBurney

General Motors Corp. is planning two prototype double-duty aircraft and plants embodying GM's recent proposal for factories which can combine civil and defense production or can concentrate on either type production as needed.

The new CM plant concept is being watched closely by the manufacturers who have heretofore constituted the

permeant aviation industry. They look with mixed feelings at the embrace of automotive computers and their huge mass production facilities into military aircraft production work in national emergencies.

► **Fierce Competition**—The idea of such favorable competition as General Motors establishing plants which could swing into building airplanes and missile engines on short notice means, to some aviation observers at least, the

the interactive companies would be getting into the systems business to stay. This would create a new set of competitive factors which might have a permanent effect on the market for end as well as military aircraft and powerplants.

At Willow Springs, IL, just outside Chicago, GM's Buck-Olshansky Powertrain division has just broken ground for a new 1 million-sq-ft plant destined for assembly of British-designed J45 Sapphire turbos (rated at 7200-hp thrust) and, later, Austro (license from Curtiss-Wright).

**• The First Step—**A week after he made his first speech in Congress about the dual-purpose plant plan, GM President Charles E. Wilson disclosed that the Willow Springs unit will be such a plant, designed to be able to shift rapidly from jet engine production to automobile body stamping work and back to jet engines as requirements of the military and civilian production programs demand.

Shortly after Wilson's statement, Navy and General Motors announced that GM had received a letter contract to build a Grumman airplane, type not designated, at a newly assigned Arlington plant site in the Fort Worth-Dallas area, where 255 acres had been bought.

It had been consistently reported that the plane would be the F4U jet fighter (Aviation Week Sept. 17, p. 11). Later speculation was that the first plane would be a new version of the F6U, the most powerful, swiftest FWW, previously followed by the streamlined P53D variable-wing fighter.

Many announced plans to provide machine tools and related equipment and flight test facilities for military aircraft production at Arlington, but stated that this equipment would not be used for automobile production.

In discussing the design, concept, Wilson disclosed two plant layout drawings, one showing how plant could be used for production of jet engines and auto body stampings, and the other showing how a plant could be designed for airplane assembly and for automobile assembly. The drawings show the portions of each plant that would have to be special for one or the other purpose and portions that could be used for both production

Double Action—Others, criteria locker rooms, hospitals, powerplants, tool rooms, maintenance departments, railroad sidings and parking lots would be useful for either purpose, Wilson pointed out.

Space, construction and equipment for jet engine test stands, he stated, would be useful only for that purpose. Likewise the space, foundations and heavy power for making large steam cars would be useful only for auto-



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## AVIONICS



RESIN PATCHING is applied to damaged radar dome on Navy's aircraft carrier. Shown here on an aircraft are frequent damage cases.

## New Resin Repair For Radomes

Navy technique will result in salvage of plastic housings which formerly were discarded as useless.

Repair techniques have been perfected that will convert radomes burned for the discard pile back into service life.

Salvage of these aviation housings eventually will save hundreds of thousands of dollars yearly for the Navy Bureau of Aeronautics' maintenance division, for whom the repair methods have been developed. Thus, at the Norfolk Naval Air Station alone, it has been found that an average of 14 radomes valued at from \$1,000 to \$1,000 each had been discarded each week through burner inability to make repair.

► **Goodies** Review: The new techniques were perfected at the Naval Air Development Center's aviation electronics and electrical laboratory in Jacksonville, Fla. Unlike an old-time power or "contact" resin-epoxy liquid usually of the allyd or polyester class.

Mixed with solvents, these resin change their physical form, though the process of polymerization, from a liquid to an inflexible solid. This property enables them to be prepared in various and other constructions for which casings shapes would otherwise involve the use of elaborate and expensive molds. With the correct resin, the mold may be of plastic, wood, metal

or glass fiber laminate, and since only contact pressure is required, kept pieces are not needed and cut a hole to a minimum.

► **Training Phase**—Because BuAer is making it salvage of a major portion of damaged radomes, it has taken steps to



SELF-HEALING paint on PVT wing tip radome at NADC, Jacksonville, Fla.

ensure that personnel will be available for the specialized work on their critical aviation components. NADCA's aviation electronics and electrical lab, in cooperation with BuAer's aviation science division, has set up a training program in repair procedures. Technicians from five Naval air stations and a Marine Corps air station have taken the course of instruction on the chemistry, methods of preparation, molding techniques, basic electronic theory as applied to radome and effects of patching in properties.



## Carrier Amplifier Is New Laboratory Tool

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### Electronic Totalizer Counts 100,000 Cps.

High rate counting is rapidly at 100,000 cps, in the distance of two new models of the Detronics electronic totalizer obtainable from Stattek Instrument Co.

Model TU-9 records impulses up to 30,000 cps, model TU-10 extends the counting range to 100,000 cps. Both units weigh only 10 lbs., are 11 in. by 5 in. by 5 1/2 in.

Both units have ac/dc base plugs for individual or screen mounting. Power supply is 100-400 v AC at 12 milliamps, with an input-output pulse of 100 v negative.

Tubes and controls are shielded in aluminum alloy. The units can be cascaded, and mounting is external and instant.

Literature, price and discount information is available from the manufacturer, Stattek Instrument Co., 1560 Hillcrest Ave., Los Angeles 27.



### New Relay Design

Another innovation, heretofore unaided relay is being offered by the Hickman Co., Inc., Elkhart, Ind. Hickman developed the relay in cooperation with the North Electric Manufacturing Co. of Colton, Ohio.

The relay has an eight-terminal hermetically sealed leadless 0-0 in. dia. and a new design, balanced armature relay sealed in a drawn aluminum can.

The unit can be panel mounted from either top or bottom. It can be hermetically sealed with dry nitrogen.



### VULCAN NEEDED AN ANVIL...

But Philco forged a mighty weapon with a change of name! When the Armed Forces needed vast quantities of Microwave Radio Relay equipment, Philco's standard commercial product met the exacting requirements without change! Philco *Advanced Design* Microwave already contained JAN-approved components and military type plug-in assemblies. So with only the change of name from Philco *Advanced Design* Microwave to AN/TRC-30, it was ready for military use.

Philco Microwave equipment is designed for utmost reliability, flexibility and ease of maintenance... qualities demanded without compromise by the Armed Forces. Philco's ability to surpass these rigid standards provided the Armed Forces with an immediate source of vital communications equipment.

Today, as always, forward-thinking Philco stands ready to develop and produce advanced electronics equipment to meet any need of the Government and the Armed Forces.



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GOVERNMENT AND INDUSTRIAL DIVISION

PHILADELPHIA 34, PENNSYLVANIA



# for quality aviation instruments... ...specify Sperry

The entire fleet of DC-6B passenger transports in the Pan American and Panagra services will fly with Sperry instruments. These instruments complement one another, making it possible for the inner pilot to uphold his line's reputation for safe, smooth, comfortable, enjoyable on-schedule flights in all weather and conditions of visibility.

In its dependable monitoring of flight hazards and delays, Sperry equipment reflects both the Company's 40-year experience in the aviation field and the effective teamwork and world-availability of Sperry field engineers.

All over the world, aircraft of every type—commercial and military—are getting top-quality performance from the top-quality equipment designed and manufactured by Sperry.

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1. **A-12 Gyrostat Push and Controller.** The A-12 Gyrostat provides complete automatically-stabilized control of the aircraft through all weather. The Pusher Controller enables the human pilot to make coordinated turns and altitude changes by slight finger motion while the aircraft is completely gyro-stabilized even in rough air. Rates of turn, climb or descent are automatically maintained.

2. **A-12 Automatic Approach Controller.** With this standard accessory, the A-12 Gyrostat automatically guides the aircraft to the runway with signals received from the instrument landing system.

3. **Zero Reader.** The Zero Reader is a simplified gyroscopic indicator which places together attitude, altitude, heading and radio gear information. It shows the pilot instantly and continuously whether he should steer left or right, or go up or down—relieves him of complex mental calculations on approaches or landings.

4. **C-2 Gyrocompass Compass.** The C-2 Gyrocompass Compass is a Directional Gyro synchronized with the earth's magnetic field by means of a Flux Valve. This instrument—a gyro-stabilized compass in effect—gives accurate magnetic heading, requires no resetting and provides stable directional indication under all conditions of air turbulence.

5. **H-5 Gyro Horizon.** By means of a miniature airplane and gyro actuated horizon bar, this flight instrument shows the pilot what he would see if he had good visibility outside—whether the plane is banking, climbing, gliding or flying level. The H-5 Gyro Horizon is non-hampering and requires no caging.

6. **Engine Analyzer Indicator.** Its graph-like patterns give the flight engineer a continuous visual analysis of each engine during flight—momentary defects, losses and identify any irregularity in engine operation. Upon landing, the flight engineer reads ground crew complete data on parts in need of servicing, thus making possible frequently spectacular savings in maintenance time.

7. Zero Reader Heading Selector
8. Zero Reader Selector Switch
9. Zero Reader Control
10. C-2 Gyrocompass Compass Amplifier
11. C-2 Gyrocompass Compass Flux Valve
12. Engine Analyzer Synchronizing Gearmotor
13. Engine Analyzer Cycle Switch
14. Engine Analyzer Condition Switch
15. Engine Analyzer Power Supply-Amplifier

16. A-12 Amplifier
17. A-12 Automatic Approach Amplifier
18. A-12 Vertical Gyro Control
19. A-12 Gyrocompass Compass Control
20. A-12 Pilot Engaging Control
21. A-12 Servo Control
22. A-12 Rudder Servo
23. A-12 Aileron Servo
24. A-12 Elevator Servo
25. A-12 Elevator Trim Tab Servo
26. A-12 Flux Valve



SPERRY's latest model portable analyzer, and . . . SCINTILLA portable analyzer which can be airborne. Both with four.

## Plug Refinements Up Engine Reliability

- Champion conference is shown latest improvements and also hears debate on portable analyzers.
- Use of hexagon steel stock and new methods of making gaskets saves tons of critical materials.

(This is the second and concluding report on the recent Aircraft Spark Plug and Ignition Conference sponsored by Champion Spark Plug Co., Toledo.)

By George L. Christian

Toledo—The spotlight of the recent Aircraft Spark Plug and Ignition Conference here was on:

- How to improve spark plugs
- How to save critical materials in making spark plugs
- The comparison between Sperry and Scintilla in the field of small engine and ignition analyzers

### Spark Plugs

B. K. Christie, Champion's director of research, and there were many theories on how to improve a plug—most of them mutually contradictory. Should the insulator nose be long or short? Ring slots large or small? Electrode diameters fine or coarse? Gap dimensions narrow or wide? Should porosity for Venturi effect be incorporated in plug nose design? These are a few of the problems which must be resolved.

Thermo-Tools—Tools have been developed to probe the problems of improving spark plug design. Two used by Champion are the thermoelectric plug and the Thermo-electrometer, popularly known as "Chest" (Aerospace Week Sept. 15, 1950, p. 10).

The thermoelectric plug, which incorporates thermocouples at critical hot spots such as center electrode, nose insulator, etc.) is currently being evaluated on the R-16's R-1660 engines, according to Christie, but Champion has not yet had time to conduct the results. The device is one of the latest hot tools engineers have devised to solve spark plug heat troubles.

The Thermo-electrometer, unveiled at last year's convention, has secured its much interest in its first year of existence that Champion offered to make it available to the industry if desired without cost, although, as Christie stated, "We are spark plug manufacturers, not gasket makers."

Costs would probably come in very handy as a training aid, since its function is to predict insulator nose and center electrode temperatures under the stress variables of engine operation: fuel/air ratio, cylinder head

temperature, inlet air temperature, spark advance, open/closed throttle, and exhaust back pressure.

New Plug—Champion rolled out a show case exhibiting selected ones of its five latest spark plugs, part of 13 experimental plugs now approved.

R175-1E, Features glass center electrode seal, threaded terminal. Will supersede the R175-1D.

Status: Approved by engine manufacturers and military services.

R165, Features nickel plug having 1/16-in. shorter insulator nose; has glass center electrode seal, threaded terminal.

Status: Approved by WAC for the R-1150-5070 compound engine.

R165, Features colder than the R165, has a 5/32-in. shorter insulator nose than R175-1E; incorporates glass center electrode seal, threaded terminal.

Status: Approved by WAC for the R-1150-3070 compound engine.

R165, Features high altitude barrel construction incorporating the 4-30 (low) glass center electrode seal, threaded terminal. It is high altitude counterpart of the R175-1.

Status: Approved by WAC for the R-1150-52. On test by AMC and General AFB on the R-1160.

R175, Features high altitude barrel construction, has 4-in. shorter insulator nose than R175-1E; incorporates glass center electrode seal, threaded terminal. It is high altitude counterpart of the R175-1.

Status: Approved by WAC for 972-



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# PREPAREDNESS PRODUCTION Enlists AMPHENOL



**RG CABLES** prepared by Amphenol are bonded by means of manufacturing experience. The majority utilize polyethylene which guarantees exceptional dielectric properties—low loss, low dielectric constant, excellent aging characteristics—low loss, low dielectric constant, excellent aging characteristics. The result is a cable designed to operate efficiently in the field.

**RF CONNECTORS** for electronic test equipment and all types of radio circuits. Available through Amphenol's nationwide distributor network. They have larger leakage paths, better shielding in design. They have larger leakage paths, better shielding in design. They have larger leakage paths, better shielding in design.

**AN CONNECTORS** for general signal and control circuits in control and electronic equipment. Amphenol's standard design is available in a wide variety of styles. They are the standard reliability factor of all Amphenol products. They are the standard reliability factor of all Amphenol products. They are the standard reliability factor of all Amphenol products.

**New Available**  
Cable to connector systems incorporating both an Amphenol RF Cable and Connector. This system will be the most reliable system available in the present state of the art.



**AMERICAN PHENOL CORPORATION**  
1620 South 34th Avenue  
Chicago 20, Illinois

1-1318 DAI (R-1318) compound design for the 104RB Super Connector, 1975 CDS-CAI (R-1318) compound design for the 104RB Super Connector, 1975 CDS-CAI (R-1318) compound design for the 104RB Super Connector.

Also shown were the R-1314 plug, incorporating a high altitude barrel, platinum fine wire electrodes and closed nose insert construction, glass center electrode seal and threaded turn-in. Chrome and that the plug, although expensive at the moment, gave excellent electrode life and was available too from some time before. Model tests on the R-1314 are complete and it is currently being tested by AMC and USAT in this engine.

**Saving Steel & Copper—Kia and Vogel.** Champion's chief engineer, cited these highlights of his firm's efforts to save natural materials, primarily steel and copper.

Champion makes twice the copper plug gaskets from the same weight of material as before by casting them from 525 in. sheet instead of 360, adding them in the shape of an "8" then compressing the whole unit. The company can save \$5,000 lb of copper per 1,000,000 gaskets manufactured.

The new gasket has no top or bottom and positions the plug within .001 in. of the same location as when the old gasket was used. That dimension that determines the accuracy of both gaskets are essentially the same.

Champion also has a steel spring where up to date is according to Vogel. The plug, under consideration by USAR, Navy and engine manufacturers, is a new plug out of 5 in. hexagonal stock. Eliminating rolling the 4 in. hex, an insert style plug, would save 373 tons of steel per 1,000,000 plugs. Vogel pointed out.

**R-1314-DE & R-1314-CE** Champion engineers confirmed the production status of the glass center electrode plug R-1314-DE plug. 68,000 R-1314-DE plugs have been made in the last 12 months.

Problems in need for a production type design to be the glass seal. This is being solved and Champion anticipates a production rate of 10,000 in. die within six weeks. D and E versions of the plug will be manufactured and shipped some time in the next few months.

The length of the E plug from gasket seat top of plug has been shortened on the E to simulate its design with other plugs.

**Proper Plug Packaging—Some of Champion's plugs are being packaged in a new manner. The old style tube package is giving way to a 30 plug carton with cardboard divider to cup under the plug. Advantages claimed are easier disposal of unsold plugs and more than 50% reduction in cost 1964 vs. \$1.50. Champion asked for opinions on the new package and En-**



## STRIPPABLE COATINGS

3M strippable coatings are designed for the protection of finished metal surfaces against acids and abrasion during fabrication. These vinyl coatings form a tough, abrasion-resistant film which protects metal thoroughly.

The coatings can be applied to blank or cold stock—before fabrication or between any stage of production—and greatly facilitate the handling of metal from manufacturer to fabricator to consumer. Your metal ends up smooth and unscratched—inspects as expensive ready-to-ship.

These low-cost, fast-drying coatings are easy to work with too. They can be applied in room temperature, using standard spray equipment, and can be stripped off as films as thin as .001 in. or as thick as .010 in. Strippable coatings also give you an important source of nothing "logos."

Investigate the potential of these coatings, then take advantage of their money-saving abilities. Contact the 3M field engineer nearest you, or write directly to 3M in Detroit.



## COATING EC-988

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**USE:** prevents rust from scratches, most often seen on various stages of stamping, drawing and fabrication. prevents general, polished or plated components from being scratched and scratched. helps other parts of sub-assemblies are scratched. also used in paint jobs or other non-paint surfaces which easily scratch or abrade.

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**W**ITH headquarters at East Boston's new Logan International Airport, Wiggin Airways provides fast and dependable mail, passenger, and cargo service to island communities which two years ago had no scheduled flight service of any kind.

Stream above, on the busy Logan Airport apron, are planes in for servicing. Also Logan Pacific and Laboratories are used exclusively by Wiggins both for its own planes and for the planes of transatlantic flyers. Like many other top-flight airlines, Wiggins is using the *Aviation Products* to help maintain dependable scheduled service.

**MAINTAIN AVIATION PRODUCTS**—backed by contract insurance in America's largest petroleum laboratory—are famous for high quality that helps maintain highest operating efficiency. Airbarns that keep you flying right on schedule, busy executive flyers, and private flyers know that they are dependent on the products that carry the famous Royal Warrant Royal trademark.



...having more than a  
dozen New England towns  
and villages. Boston  
is, of course, Weymouth,  
Dorchester & Braintree are  
"The Commonwealth of the  
Bay."



**WIGGONS AIRWAYS**, spacious, modern lounge facilities shown above are located in the new Administration Building at Logan Airport. In addition to complete plane servicing facilities, Wiggins provides passengers and flyers with the most up-to-date travel information.

open or closed secondary circuit

Patterns have also been successfully established for low tension and remote cable ignition systems, and conventional cable heaters.

Wheeler emphasized the value of the vibration pickup feature of the instrument. This feature enables the operator to determine valve clearance under actual, dynamic conditions, rather than under static, cold clearance. It is the actual operating clearance that is of primary importance as far as satisfactory valve and engine performance is concerned. 307-2000000

• **Crankshaft timing marker**—According to Sperry, flat timing marks and screw timing may be necessary to increase its reliability. The device consists of a variable reluctance pick-up and a small vane attached to and rotating with the crankshaft.

Sperry felt that such a device was necessary because synchronizing gears driven off the necessary rotation are subject to cross or initial clearance of the gear teeth, tolerances of shafts and bearings, wear, and windup caused by torsional vibration. Moreover, gears, usually speaking, have several engines are the only propagating regions having no nodes for determining dynamic or static equilibrium position.

• **Torque rate pick-up**—Adapted from modified Sperry vibration pick up, the sensing element feels the rate of change in engine torque and responds electrically. Installation must be close to the torque cylinder where it adequately registers even very high frequency torque pulsations. Unit is new design in service evaluation with promising results in several aircraft. Sperry says.

• **Portable Analysis—Specy** plunges deeper into the sampling analysis competition with a new portable instrument. Scientists considered the success of its handheld by offering its analysis on airborne capabilities as well as a portable unit, striking at Specy's strong hold.

Sperry listed these improvements for its portable unit:

\*Timing can be performed at the analyzer because an electrical phase shift at the test was substituted by a mechanical shift of the stator of the synchronizing generator. This prevents installation of the synchronizing generator without regard to phasing. An ignition pulse pick-up is provided for small aircraft on which sync generators are not installed.

- **Checking of engines with any number of cylinders, from one up, easy to do with the Sperry instrument simply by installing the dial plate corresponding to the engine's firing order and number of cylinders. It also permits**

checking the number of crankshaft degrees between one two-stroke event.

- Testing facilities without external loads have been provided for high or low torque systems on the R-4308
- Frequency variation of supply line to the motor is permissible from 50 to 500 cps

- Analyzer may be tilted by adjustable legs, front cover serves as a writing table when open

Price of the unit has been reduced approximately \$1,000 to around \$2,200. This is still more than double the cost of the Scintilla portable analyzer.

(Continued on p. 61)



Regardless of load, speed, acceleration, or flip position, the detector gives reliable, prompt warning of its primary determined anomaly. It activates the Safe Flight control shaking

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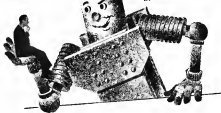
|                             |                               |
|-----------------------------|-------------------------------|
| <b>JAMISON</b> Connor [M]   | <b>MAFIAA</b> Anthony         |
| Boyle Super BC 3            | Chase Vought [M] 1000         |
| North 0-725                 | Douglas AD 300 1000, 100 1000 |
| <b>OSMAN</b> Aimee [M] 1000 | Greenwood [M] 1000            |
| North 10 30                 | McConnell [M] 1000            |
| Crane [M] 1000              | North 100, 100-40 1000        |

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There's only one quick way to get more steel!  
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Let's be realistic about the scrap shortage. The need for scrap is desperate. It threatens to hamper our whole National Defense effort—and it vitally concerns you because it holds down the price.

Unless 100,000 tons of industrial scrap roll into the steel mills every day, steel production will drop, and there'll be less steel for everyone—you included.

On the other hand, if more scrap is turned in, more steel will be turned out—and the more steel that's made the more steel you'll get.

So—if you want more steel—do your full share in getting your scrap back to the mills. Comb through your plant, again and again. Tap every source of dormant scrap. Dig out every retired machine that

you can possibly spare and rush it to your scrap dealer. Rip out any old rods and switches that are rusting away on unused sidings—and scrap them. Scrap your antiquated dies, jigs and fixtures, your worn-out tanks and boilers that are gathering dust in some forgotten corner. Make sure that not a single pound of scrap is by-passed. Sell it—ship it. It means good money for you, more scrap for the Nation's scrap pile, and more steel for everyone.

\* \* \*

Remember—the Nation's productive effort depends primarily on steel—and steel depends on SCRAP... your scrap. Turn it in—NOW.

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**SHELBY SEAMLESS AIRCRAFT TUBING**

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we are asking instead for your all-out help in getting  
more SCRAP to the mills.

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WATER STREET 1025, ERIE, CALIF. (NEW YORK)



UNITED STATES STEEL

6104

(Continued from page 57)

• **Scientific Staff**—Clayton Welch, Scientific's chief sales engineer, which admits that the results obtainable with either analyzer would be essentially the same, pointed out that the approach to the problem of ignition analysis by the two companies was different. He reported his company's analyzer philosophy on these three pillars:

- **Economy.** The Scientific instrument costs about \$100, the Sperry portable about \$1,200.
- **Versatility.** Scientific's portable can sense and record portable analysis on one unit, which can be used on any type of engine. An engine mounting to support part of its fuel with one type and the rest with the other, would have only one base analyzer to buy.
- **Load control.** This exclusive Scientific feature enables an operator to reduce current flowing to the spark plugs and only until the weakest plug stops firing. Welch emphasized the utility of such a control, pointing out that it can increase plug removal time by locating the first plug to fail. The remainder may be left in for additional service.

Sperry questioned the usefulness of load control, stating that if two or three additional engines and was a burden on the operator since it required him to run an additional check. Sperry said that the first indication period up by load control's no-load reduction is a weak plug which is not necessarily harmful. Next indication is a fouled plug, but this shows up in the pattern as the scope anyway in. Wheeler reasons, load control is not worth the trouble or cost of installation.

• **Brooker Spectrometer**—Which said that the single tube was a very good, accurate type burner Scientific's analysis on the engine to tune its analyzer to the combustion is a good and reliable piece of equipment. Six breakdowns having 600-700 hr. service life so there have given no indication of being changed, he said, while his unit costs with 1,500-2,000 hr. show very little variation. Welch backed up his statement with the observation that turbine changes on aircraft engine burner assemblies with modern units were very tight with one, probably 2-3 day. He concluded that back lash in the fuel-metering governor drive plus fuel used to power the burner is a problem.

• **Copilot.** Cosmanti—Trans Canada Air Lines came up with more cogent comments about analyzers in general and about load control in particular. R. W. Favre, TCA's engineer, came out flatly in favor of load control. He stated that in preliminary tests the system had indicated marginal misfires and plugs which subsequent tests confirmed he was weak units.

• Favre pointed out that TGA is

probably the first airline to report all its planes to one analyzer. All TGA's aircraft, including the venerable DC-3, are being wired to accommodate a portable Scientific unit. Not having a light engine, an adhesive installation would not be practical.

Favre stressed that TGA "was clearly the introduction but it was delayed with analyzers. But it was hard to convince the 'higher-ups'."

Three factors convinced TGA that analyzers were for them:

- Ignition was the culprit which gave the greatest number of delays, despite timely spotting.

- Ignition delays were almost invariably long delays, often running into hours.
- Ignition troubles caused an extremely high rate of unnecessary cancellations. For example, 45% of all trips and 93% of all single trips were canceled without reason.

TGA feels that if the analyzer will show the pilot to say "It's the mag that's bad"—or the plug, and which plug, the analyzer is perfect. "It's just as simple as that," Favre said. He does not envision his mechanics going into deep theoretical analysis of the trouble at hand.

Favre and all others fingered by the

## NEWS NOTES

### AIRBORNE RADAR FLIES IN EDO-BUILT NACELLES

That's not a bomb on this latest carrier-borne Navy attack bomber—the Douglas AD-4Q—is its airborne radar housed in a streamlined aluminum nacelle built by skilled craftsmen at Edo. Hundreds of these airborne radar nacelles have been built at Edo's College Point plant where more than a quarter of a century ago the first all-aluminum airplane fuselage was built.



The Edo Corporation's twenty-six years of precision metal-working know-how are being put to good use on a wide variety of aircraft

components ranging from airplane fuselages for commercial airplanes to fuel and oxidizer for the J-48 Thoraxjet engine.

Edo has also come to be known as a leader in the field of electro-mechanical equipment for large naval vessels and is a prime supplier of the latest ocean equipment of far greater range and accuracy than has been previously possible. Because of Edo's intensive knowledge of both marine and aviation fields, significant improvements in navigation and communications have been incorporated into this increasingly important electronic equipment.

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COLLEGE POINT, NEW YORK







**PRECISION  
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**Self-locking  
SOL-A-NUT withstands  
JET HEAT**



Widely used on turbine systems, propellers, superchargers and the like, SOL-A-NUT has proven its stamina on jet engines, too. Surely, one-piece stainless steel construction ensures long life . . . no corrosion if raked or scratched. Reasonable in cost, quick and easy to spot-weld, SOL-A-NUT cuts assembly time in both manufacturing and maintenance operations.

Monadnock, with a wealth of forming experience, also has valuable design and production facilities available to manufacturers of quality products.

**MONADNOCK  
MILLS** See leaders  
in quality  
a subsidiary of UNITED-CARBIDE FASTENER CORP.

can and was actively engaged in one racing them.

#### Here & There

NWA, pioneer experimenter with Packard's resistance spark plug cable, the so-called "wrench nut," steel it had equipped an R-4360 engine with it to check analyzer operation.

Result was a definite effect on the pattern, but the analyzer remained perfectly usable.

NWA is now considering the effects of cold weather on the cable. Analysis indicates they would not fail the cable were National, PanAm and Trans-Canada.

Five-way high tension leads coated with Teflon for low friction operation on R-3358FD engines using spark cable are giving excellent results at EAL. And they are cheap.

If distribute number leads are removed from the Scintilla D483-2 mag units, resistance at ground (at 18,000 ft.) will drop from 31,000 ft. to 32,880 ft. according to the makers. These cables are not recommended.

Scintilla is working on, and believes it has the answer to, the problem of making a mag breaker point which can be changed in the field without effecting the dwell point.

Answer may be an elongated fastener screw hole to permit holding disc dimensions between every line of a fastener screw and center line of cam followers.

Chrysler's Bruno Mesa, himself the spark plug of the roadrunner, kept the assembly meeting alive with spirit and timing. Many comments were overheard that this was the best of seven excellent conferences conducted by Chrysler.

#### Bendix Gets RAAF Equipment Contract

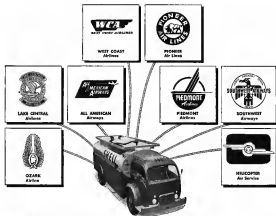
(McGraw-Hill World News)

Melbourne, Australia—Largest order of its kind yet placed by the Royal Australian Air Force, reportedly amounting to several million dollars, has gone to Bendix Aviation Corp. of U.S.A. and its Australian partners.

The order is for Australian patented aircraft electrical equipment and was negotiated by Bendix general manager G. T. Zanol.

Bendix recently became associated with the Australian firm of Thomson and a large part of the order will be supplied by the new firm of Bendix-Thomson Pty. Ltd. from its factory at Mascareville, Sydney.

Further orders with Australian companies are expected to be placed by RAAF.



Logos for airlines: WCA WEST COAST Airlines, KIONER PREMIER Air Lines, LAKE CENTRAL Airlines, ALL AMERICAN Airlines, MEDMONT Airlines, SOUTHWEST Airlines, SOUTHWEST Airlines, and HELICOPTER Air Service.

## Shell supplies Aviation Fuel to all these local Service Airlines

THESE 8 airlines are important scheduled businesses . . . vital components of the greatest flying network in the world.

Shell's growth in the aviation industry and its research has paralleled the growth of air transportation in every respect.

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36 N. CLINTON CHICAGO 8, ILL.



**SORTING** of mud-and-water-soaked papers after destructive Kansas City flood waters made a last day on TWA's valley.

## How TWA Saved Its Files

Kansas City, Mo.—What can an airline do to salvage its records after they have had a week-long mud-and-water bath?

That was Tulsa World Airlines' problem when the Kansas City flood July 13 poured up to 15 ft. of water in its office area, soaking all cost accounting and payroll records, and everything records bring \$17-million worth of cargo and spare parts. Also damaged by the surging water were Delta and Memphis reports, vellum and blue prints.

H. E. Probstman, TWA's general office manager, and Marie Adams, supervisor of files, called CAB, the National Archives in Washington, and other groups which might have had a similar problem for advice on how to salvage soggy paper. Their calls resulted in little information.

► **Household Recipe**—So the better known the laboratory for investigating the best methods of salvaging paper, and the bayside area because the technicians. Over-taking the records was futile; laying them out on the floor proved better, but too slow.

The flat area was used for small, fuzzy records, household manuals for vellum and blue prints. Heavy cards such as Kansas docx sat on the floor. Large blueprints, too bulky to run through mangles, were neatly folded over cardboard.

When the water in the office dropped to the 2-to-3-ft. level on July 23, Probstman and now were faced with the problem of finding a building large enough to house all the paper as

it was traded from the office. And how to wash a million pieces of paper and keep them wet to prevent drying out and rotting. And how to combat mildew which was fast setting in.

Kansas City's Board of Education proved to be TWA's salvation. They offered the use of a high school, complete with swimming pool. After conducting careful tests to make sure the chlorine content of the water would not bleach prints, track after truck of paper was hauled to the school, where the paper was given the type of treatment some corporations had indicated. Sevier and all on the records completed the business of salvage and made it necessary that personnel handling the records be vaccinated for typhoid.

► **Tools for Salvage**—New mangles and a dozen flat areas were laid up at the swimming pool's edge. Paper was laid to them as it was washed. Many records were stored in the pool to prevent drying and shrinking. Some 1,000 ft. of clothesline were strung around the school to hang prints on, while hundreds of square feet of floor space were covered with brown cloth. Boxes of tea contained air to speed drying. "Minkol" was sprayed on mildewed records and proved as effective as ozone agent to fungus, a good disinfectant.

After 27 days and 27,000 man hours of record-the-check, sloppy labor, a great percentage of the records had been saved. Probstman said that just now packing and folding the paper was as well a man-made job. He estimated that it would take cost TWA over \$100,000 to replace the records. (Continued on page 65)

## This Is the Way They Did Their Wash . . .



**WASHING** in high school swimming pool is the next step. Employees handling the records, part of TWA's 1-million-piece list at Kansas City, had to get typhoid shots because of sewage contamination. Cleaned papers are loaded up for . . .



**IRONING** on mangles (the Sharpshins not visible) and with flatirons (the smaller papers). Nine mangles and 12 flatirons were used. Records this were found to dry better when laid out on the line in the school hall.



**HANGING** proved to be the answer for Sharpshins too large for the mangles. Ninety-five yards of the steel wire with negligible loss. TWA figured it would save cost \$100,000 to replace the records, if replacement was possible.



## getting off the ground — FINANCIALLY

New or expanding firms in the aviation field with excellent technical prospects are often held back because of financial hardships.

Perhaps your company is faced with a similar situation? If this is the case, our familiarity with the financial problems of the aviation and allied industries can be of value to you.

**Our activities include:** *Banking Arrangements—Mergers and Acquisitions—Public and Private Financing—Financial Advisory Service.*

You are welcome to discuss your particular problems with our partners. Without obligation, call or write Department T-5 at an appointment.

### BURNHAM AND COMPANY

Headquarters New York Stock Exchange  
19 BROAD STREET, NEW YORK 4, N. Y.

(Continued from p. 96)  
\$300,000 to replace the sounds all saved—had that been possible.

► What TWA Learned—Here are some lessons TWA learned the hard way in the disaster:

• Metal file cabinets usually held up well, but if full, melting paper burnt open the fronts. Wooden file drawers failed.

• Photograph negatives stored in bond paper envelopes were generally salvageable. Those stored in manila envelopes were ruined because the soft envelopes stuck to the prints.

• Flood turned out to be the most nearly indestructible form of recording, according to Postmans, closely followed by beta risk. Other, micrograph and typewriter prints generally came out all right. Ordinary ink washed out badly, as did Dymo. Postmans added that the blue Dymo color contains coated dry solvent papers, making them useless.

• Microfilm gave TWA a pleasant surprise. About 15,000 ft. of film was back and serviceable two days after being sent to Records for reevaluation. TWA stored the film in waste paper baskets full of water when sending the film to Records. Lots was lost.

Cost of the tremendous salvage was negligible since most of the employees who did the job normally worked in the Record Out Office. And TWA is proud of the willing hand its hundreds of employees gave during the emergency that could have turned into a catastrophe.

—G.L.C.

## Automatic Approach Trainer

An automatic landing approach flight simulator designed to simplify training of USAF ground personnel in maintenance of automatic approach equipment has been developed by Northrup Aircraft, Inc.

To achieve maximum realism, the device duplicates the flight of a Northrup F-49 Superfortress all-weather fighter during extensive ground approach procedures.

A platform model plane is pivoted on a control pedestal to provide pitch and roll. The pedestal can rotate on its base to provide yaw. The model is fitted with an engine, wooden and glass propeller, gear, Zero Radar, master beacon, remote indicating compass and cockpit lighting equipment.

Master beacon, headlight and glide path indicator signals are broadcast by test facilities externally controlled by the model as it maneuvers. The instructor operates the simulator flight controller to program approach flights involving single maneuvers such as roll, climb, descent and turn.



## Do you want a career with a future?

More and more of America's outstanding engineers are carving fine careers for themselves at Boeing. If you've found a future here in an engineering Division, that's been growing steadily for over 35 years.

If you measure up, there's great opportunity here for you, too, and the rewarding experience of working on some of the nation's most vital programs such as the B-52 and B-47 jet bombers, guided missiles and other revolutionary developments.

You'll associate with some of the highest engineering talent, men who can help you further your own profes-

sional standing. You'll find here research facilities that are among the world's finest. And you'll enjoy a good salary that grows with you.

Headed now by Seattle are experienced and junior mechanical, mechanical, electrical, chemical, civil, mechanical, weapons and testing engineers for design and research; aeronautical, systems, structures and analysis; and physical and mathematical with advanced degrees. (Some training is available in Seattle then in most other major industrial centers.)

Or, if you prefer the Midwest, similar openings are available at the Boeing Wichita, Kansas, Plant. Superior industrial such a professional will be referred to the Wichita Division.

Write today in the address below or use the form on the right.

**JOHN C. JENSEN, Dist. Engineer—Product Development**

Boeing Airplane Company, Seattle 41, Wash.

Engineering specialists at Boeing interested in you. Please send me further information.

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Every pound of dormant scrap you can furnish will help to keep the steel mills and foundries producing



Steel mill foremen are gubbing up scrap faster than it's being delivered. To maintain plant schedules of steel production for both military and civilian purposes, the mills must have more iron and steel scrap.

## Get in the Scrap—Youself!

Wherever your business, you are doubtfully here scrap. If there's dust on it or rust on it—it may be scrap. If it's scrap—it's needed.

Turn it over to your local scrap dealer and help him build scrap storage.

## What you can do to help

1. Appear on top official in your plant to take full responsibility for removing the plant and getting out the scrap.
2. Consult with your local Scrap Mobilization Committee about its program to help get on the scrap train. The secret office of the National Scrap Mobilization Committee, Department of Commerce, can tell you what your local Scrap Mobilization Committee is.
3. Call to your local scrap dealer to help you work out a practical scrap program. No for-profit scrap needed, too!
4. Write for free booklet, "Scrap Management: Your Program for Emergency Scrap Recovery", addressing Advertising Council, 25 W. 45th St., N. Y. 18.

## FACTS YOU SHOULD KNOW ABOUT STEEL PRODUCTION

|  |           |                       |
|--|-----------|-----------------------|
| Steel production.....                      | 1958..... | 97,000,000 net tons   |
| Estimated capacity.....                    | 1952..... | 79,500,000 net tons   |
| Purchased scrap used.....                  | 1958..... | 25,500,000 gross tons |
| Estimated purchased scrap requirement..... | 1952..... | 36,200,000 gross tons |

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NEW YORK 36, N.Y.



## NEW AVIATION PRODUCTS

### Plane Fuel Treated

A new dehydrator, designed to remove moisture from aviation gasoline with maximum effect, has been developed by Bowers, Inc.

Engines using fuel previously treated by the dehydrator will gain in higher combustion efficiency, reduced carbon formation and corrosion of working parts, Bowers claims. Small quantities or large drops of water can be eliminated easily with the new unit, it says.

The device comes in capacities of 150 and 600 gpm. and can be used for maintenance working pressures up to 125 psi. Dehydration is accomplished by passing the fuel through a combination of vertical cyclonic cylinders, specially treated condensing coils, preheated metal and glass cloth. There are no moving parts, and with reasonable care the elements in the dehydrator will last indefinitely, according to the company. Where there is the possibility of large volume of water in the fuel, a freeze-back balanced, automatic system is available as an accessory.

Bowers, Inc., Fort Worth, Tex.

### Actuator Control

A new remote temperature control system for use with actuators has been developed by Barber-Colman Co.

Dubbed the "Microphic," the system is intended for control of any standard reversible actuator in actuators which accommodate mechanical or electrical follow-up and a direct feedback from the actuator. As explained by the firm, the Microphic "has a pre-positioned pulse duration that acts instantaneously on system response in microseconds and actuator speeds for accuracy, stable control."

Barber-Colman Co., Aircraft Division, Rockford, Ill.



### Breeze for Avionics

Space-saving, vane-actuated blowers for cooling avionics equipment such as radio transmitters, radar sets, detection

devices, etc., have been placed on the market.

These compact units are made in sizes ranging from a diminutive 2-in. model to a 6-in. diameter model. Intermediates sizes are available. The fan motor, placed directly into the instrument, is large cool enough to operate at top load conditions, ensuring delivery by fan of maximum air volume and pressure, the maker explains. Speeds range from 3,300 to 10,000 rpm., de-

pending on requirements. Blowers are made of aluminum alloy, are available in models for operation on either a.c. or d.c. current.

Sweet Tool & Machine Co., 47-08 37th St., Long Island City 1, N. Y.

### Aircraft Coupling

A new quick disconnect coupling for aircraft electrical conduct has no threaded connections, but operates when a pull of 16-18 lb. is exerted.

The coupling is joined or disconnected through action of a series of interlocking fingers around the circumference of one section of the part. The



## TURBOJET ENGINE TEST UNIT

Designed especially for fast movable shooting and overhaul timing of all Air Forces

and Navy jet aircraft engines now in use, this portable, prefabricated jet engine test cell

has inured out links in maintenance caused previously by limited testing facilities at advanced military bases. It includes sound-proof control room, all controls, instrumen-

tation, fuel and lube oil supply systems.

Testing all operations in less than an hour, it is easily convertible to accommodate two engines on test simultaneously. In this manner the number of spare engines required at advanced bases is appreciably reduced permitting not only large savings in original equipment but in maintenance costs as well.

## JANKE and COMPANY, Inc.

AIRCRAFT ENGINE TEST EQUIPMENT

35 44 RAILROAD AVENUE

HACKENSACK, N. J.

# **HIGH-STRENGTH, CLOSE-TOLERANCE FASTENERS for the AVIATION INDUSTRY**

**UNBRAKO SOCKET SCREW  
PRODUCTS**



**STANDARD HEX BOLT**  
Type 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100

**HEX NUT**  
Type 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100

**HEX HEAD BOLT**  
Type 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100

**HEX HEAD CAP SCREW**  
Type 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100

**HEX HEAD CAP SCREW**  
Type 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100

Several decades' experience in the manufacture of fasteners for the most critical applications is your assurance of complete reliability in every SPB Aircraft Product.

The finest equipment, workmanship and "know-how" are lavished on these vital aircraft parts. This has resulted in widespread acceptance and approval by government and civilian agencies alike.

## **FLEXLOC SELF-LOCKING NUTS**



**STANDARD HEX NUT**

These nuts require little or no lubrication and are suitable for use in aircraft applications. They are made of high strength steel and are available in a wide range of sizes.

**HEX NUT WITH LOCKING WASHER**

This nut is used in conjunction with a locking washer to provide additional security. It is made of high strength steel and is available in a wide range of sizes.

**HEX NUT WITH LOCKING WASHER AND LOCKING PLATE**

This nut is used in conjunction with a locking washer and a locking plate to provide maximum security. It is made of high strength steel and is available in a wide range of sizes.

For further information on products shown in this advertisement please address departments listed. Inquiries on other aircraft parts should be addressed to Department 678.

**SPS STANDARD PRESSED STEEL CO.**  
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larger grip in pivot motion of the rotating section, depending on the location of a built-in coiled spring. While the coupling can be separated by a good, substantial tug, a tight, cushion-proof connection is secured when the rotating parts are joined, says the firm. The coupling has been positively tested and tested to 750 psi. E. B. Wiggins Oil Tool Co., Los Angeles.



## **Jet Tach Drive**

A new V belt drive, said to be highly useful in calibration of jet engine instruments, has been developed by Speed Selector.

The special purpose drive has been found most suitable for calibration of jet controllers, tachometers and other aircraft instruments. The meter system is available in several models, from eight tachometer drives of 4 hp or less, to heavier, 10-hp units.

No hunting and a nearly complete absence of sliding holds speed variations in this drive to less than .1% for any speed throughout the range, the company says. Speed ranges from 150 to 7,500 rpm, and drive rates up to 92.1 are achieved by corresponding torque from self-coupling combination drives.

Speed Selector, Inc., 118 Noble Court, Cleveland.

## **ALSO ON THE MARKET**

Seewatcher is a small tool designed to handle difficult snow starting jobs in inaccessible locations in radio equipment, an instrument panel, etc. Cost automatically released when snow is driven right. Harwood Tool, Inc., Fremont, Ohio.

Pre-Kaps can be slipped onto grease fittings on aircraft to keep out dirt and grit. They also serve to indicate clearly location of all grease points, and are available in various colors. Van Dusen Aircraft Supplies, Teterboro Air Terminal, Teterboro, N. J.



From its use as a landing light cover on the nose of a globe-circling plane, to a partition as aviation's standard material for transparent enclosures and windows—PLEXIGLAS has kept pace with the industry's rapid growth.

In 1938, when Howard Hughes took off on his flight around the world, PLEXIGLAS rode with him—shielding the landing light in the nose of his Lockheed 14. It was a dramatic use of a new material. Within less than two years, Huls & Huls had developed methods of producing and forming large PLEXIGLAS sheets for airplane enclosures, and helped make possible the improved aerodynamics of the planes of 1940-50.

Today's planes, too, PLEXIGLAS is the standard transparent material. With improved

heat resistance and stress-resistant ozone resistance, PLEXIGLAS II meets rigorous Army-Navy specifications for survival high-speed, high-altitude service. And the present trend toward increased enclosure on combat planes is possible because of the adaptability of PLEXIGLAS to the necessary laminating and fabricating techniques.

For the planes of the future, Huls & Huls laboratories are working to raise the quality of transparent plastics to even higher standards. Our technicians and service staff stand ready to help in any problem involving aviation applications of PLEXIGLAS.

Our new Handbook for Aircraft Engineers should be in your hands. Send for it.

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General Huls Corp., 1000 E. 10th St., Tulsa, Okla.  
Huls & Huls, Inc., 1000 E. 10th St., Tulsa, Okla.



PLEXIGLAS landing light cover on nose of Howard Hughes plane during Lockheed 14 flight; transparent landing light enclosures dramatically the field of aircraft design and performance.

**ROHM & HAAS  
COMPANY**

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Representatives in principal foreign countries

## Blind Copter Flying Techniques Disclosed

• New instrumentation aids Los Angeles Airways in winning first all-weather operations certificate.

• Stability is a problem, but LAA chief pilots say it is no more so than in flying contact.

• And autopilots for rotor-wing aircraft are being watched with considerable interest by company.

Los Angeles Airways, Inc. was the first helicopter service to win an instrument-weather certificate. The next all-weather certificate, the problem encountered and the first success are vividly described in this article, written especially for Aviation Week by the chief pilot and director of training for LAA.

By C. E. (Kew) Kesseling

Based upon the experience which led to the granting of the first instrument-weather certificate for helicopters to Los Angeles Airways Inc., our rotor pilots' famous regularly scheduled takeoffs, flights and approaches at extremely low weather minimums at momentary notice.

At the moment we don't prefer to have all the action toward making the go. However, we have managed to do almost anything at weather minimum and maximums. In the time our two engine equipment is available, we hope to have a group of instrument pilots and approach instructors that will enable us to put it to all weather use with little delay.

• **Early Experiences**—Events leading to entry of the instrument certificate a few months ago date back to 1948. That year, just prior to the time LAA began scheduled night operations landing the mail, we installed an attitude indicator and directional gyro. Although not certain just how good a job of giving instrument flying we could do, our fixed wing flying at night made us sure that the attitude and directional gyro plus the ball bank indicator would be adequate night time aids. Except for a limited number of hours by the AA Force in 1949 as the emergency standby of airport lights, there was no night helicopter flying experience preceding ours.

From the spring of 1946 to the

spring of 1948, efforts were instead upon improving our night flying techniques and in checking and experimenting with every weather variation in the area affecting contact flight. In the L. A. area, there were none.

Finally, after gradually increasing our contact minimums in our experience built up we met a stopper. We learned that when we encountered an actual change in our contact minimums we would be forced to depart from safety standards maintained by the company. It was then and clear that the only step left to improve the reliability of an scheduled service was instrument flight.

• **Pitch Movement**—During the 1948-49 test of instrumentations we had learned a great deal about instrumentations for helicopters. First, there was the attitude gyro. It proved of great assistance in the early stages, not only as a confidence builder but as a practical aid in the blue-sky test area. The gyro was used to indicate pitch movement from a fixed point.

One need has a technique for pitch movement from a fixed point in the Sperry I-6 attitude gyro. Non-splittable, and with pitch readings on the face, the I-6 was used for approximately two years. Sperry shared with us the trouble we had using non-splittable instruments on helicopters in the L. A. area.

Due to the extra amount of dust and dirt in the air at our normal hangar of about 1,500 ft, the gyro had to be recalibrated about every 150 hr. of flight time.

In addition to the wing effect, we experienced slight attitude gyro error. Answering and apparently accurate, these errors were due to the slow speed and slight oscillation that is usual in helicopter flying. Moreover, Sperry learned that the 24 deg tilt that is used in setting the instruments for high speed, fixed-wing aircraft had to

be changed to zero. With zero settings, the instruments worked quite normally. On the favorable side, we learned that the I-6 instrument has not too small a defect attitude error while in flight.

• **New Instrumentation**—Ball bank indication came in for modification too. Due to the condition mentioned previously, the ball bank was unreliable in slightly rough air. In reducing the sensitivity of the instrument, it worked successfully and we are now able to fly the helicopter on instruments using the rate indicator only. We've experienced an difficulty with the Gyrocomp compass as it appears overbalanced at all times.

Our instrument instrumentation definitely showed upon our instrumentations—both instrumentations. They are the Sperry I-6 Gyro Compass, the Sperry I-6 Gyro Compass and the Sperry ball bank indicator. In contrast to the I-6, the I-5 Element is an unusual, their full guarantee time between overhauls with no trouble whatever.

Inasmuch as the I-5 is a conventional horizon indicator and departs from the attitude gyro face design, we have had Sperry attach a grid to the trim indicator. The grid extends 15 deg above and 15 deg below center line.

With the grid installed we believe that the completely blind takeoff is one of the easiest and most precise maneuvers that we are able to execute.

Moreover, since the cruising attitude of the helicopter is about 1 degree "nose low," Sperry has also installed the one that holds the instrument on plane so that it can be placed 15 deg nose high prior to takeoff. With this modification, use of the Gyro Compass is reduced in error, drift and drift.

• **Step by Step**—In the light of our own experiences, and in view of the experience we have learned with respect to a completely blind takeoff in a helicopter, I've set below the steps in our instrument takeoff.

- Following engine and instrument warmup period, pilot tries to takeoff position and checks flight instruments for proper functioning.
- Pilot begins motion to determine correct G-C control and exact setting of the language controls in relation to the takeoff.
- Checks direction locks on direction



NEW INSTRUMENTATION on LAA helicopter, including Sperry Gyrocomp compass at top center, I-5 Gyro Compass (bank indicator), and Sperry ball indicator, permit all-weather flying for helicopters. I-6 compass indicator is shown at right.

and pitch level for proper attitude. Pilot notes amount of roller control necessary to have the aircraft recovery depends upon such factors as temperature, surface wind, gross load. This check with the

pilot is determining necessary amount of roller for takeoff. Pilot levels aircraft in relation to bubble on aircraft for that purpose and sets minimum airplane 1 deg above horizon line.

- Pilot checks Gyrocomp compass in relation to magnetic compass heading.
- Pilot applies full power using 2,600 rpm and 15 in. manifold.
- If the pitch stick and direction is pulled through the setting of 15 deg

and 23 in. manifold, two 2,400 rpm and 17 in. of manifold results in the full power setting with a maximum amount of adjustment.

• Although outdoor practice will appear to be quite busy at the aircraft banks ground, it will decrease proportionately in the staged approach.

• As the helicopter leaves the ground with the application of full power, the attitude of the aircraft should be changed mentally but definitely to the position indicating 5 deg. dive on the miniature Gyro-Horizon display. (This is 15 deg. actual dive position approach as the altitude is set at 5 deg. above the bar pins to indicate.)

• From that point the two important instruments to watch are the Gyro compass and the Gyro-Horizon, with an occasional check on the ball bank indicator, to insure coordinated flight as the transition from zero ground speed to 10 mph, climbing winged.

• As the steeped approach 50 mph (lead the instrument approximately 5 mph), port throttle back to 1,100 rpm and 11 in. manifold (slows power setting) and change attitude of instrument airplane to a position slightly above the horizontal bar, open-checking cockpit stopped at 50 mph, to determine exact position necessary to avoid the miniature airplane on the bottom in the climb.

By following these instructions we are confident that absolutely blind takeoffs can be safely possible in scheduled passenger service. With no problem of controlling the aircraft down a runway to gain flying speed, the blind helicopter takeoff is definitely easier than in fixed wing craft.

• Lower Minimums: Our first attempt at instrument flying proved to be very taxing, but we recognized that none of our pilots had instrument flown for the past three years. Starting with six memory maneuvers we were soon convinced that we could not only fly instruments conventionally but we could work out various maneuvers and techniques that would be particularly advantageous to helicopters. We became flying maneuvers lower than those as played by present fixed-wing aircraft.

While the suitability of the helicopter is a factor to be reckoned with, it is no more insurmountable than the suitability in meeting an auto on a highway.

Admittedly, the "copter is more weak to fly on instruments than the average aircraft, but it is no less stable on instruments than on contact flight. Helicopter pilots recognize this. Further, we have kept pilots on simulated instrument flight up to two and one-half hours working maneuvers and approach problems with no adverse results in solo.

ing problems presently and no undue fatigue.

Without the practical nature of instrument flight established, our scheduled work on instruments will be limited until we have the added safety provided by two-engine equipment. Nevertheless, our operations to date, often conducted at 7,500 ft. on top of elevators but within gliding distance of clear areas, have been guided with amazing accuracy by surveillance radar.

Remembering engine failure, we have been directed by a pre-announced low-level heading with a degree of accuracy that gives up a safety factor unapproached by fixed-wing, single-engine instrument flight. This is so particularly in view of the fact that we are able to execute controlled approaches with accuracy as low as 20 mph.

• Radar Directed—Typical example of a surveillance radar-controlled instrument climbout from Los Angeles to a delivery. Radar directs the helicopter on the climbout to the coastal beach on a Gyrocompass heading of 150. Over the beach the pilot is directed to Santa Monica. Here, with a maximum altitude of 7,500 ft., the flight is directed to the Elencore Dam via a Gyrocompass track of 17 deg.

The climb to 7,500 ft. is time consuming, but safety makes it well worth the time. From that height radar can di-

rect the helicopter to a number of fixed heading from located close to the track.

A recent addition to our instrument work is the auto concept. It has been installed with plans to use it as an aid in coming hangar and in making conventional approaches into Ontario, Long Beach and Los Angeles airports.

At Los Angeles Airways we're making the instrument approach efficiency not known to fixed wing flying. We consider it an economic matter that we can't waste as much as a minute from President to L. A. where the initial flight, flying contact with our present unaided equipment, takes just 15 minutes. We believe that helicopter procedures must necessarily be directed completely from fixed wing flying and that identification on route must be so positive that straight approaches will be unnecessary after they are completed.

Before the end of the year we will install low representation rate altimeter altimeters, air speed indicators as accurate as low as 2 mph., and direction indicators operative at low speeds. We are working with several of the new developments of instrument pilots in helicopters, and can appreciate that they have a future in a precision and in recognition and as a means of fatigue.

• Zero Zero—In our opinion, approach time may be kept to a maximum by the use of close slanted glide paths with an approach angle of 5 to 7 deg. combined with fully auto systems, high intensity lights and marker beacons to provide straight in approaches from all route directions.

With respect to our experiments with conventional high intensity lights in zero zero conditions, we have been able to see the lights for a maximum distance of 100 feet. Coupled with our present efforts to execute precision approach in the 20 to 30 mph. speed range and our new instrumentation, we are optimistic about approaches in adverse weather.

With 15 helicopters in the Los Angeles Airways system alone, installing a helicopter runway opens a tremendous undertaking. Considering the potential of the service offered (making close to overhead but on credit), the economies of setting up such an array soon probable.

## Carriers Tackle Alaska Cargo Rush

As lines serving Alaska from Seattle, Wash., have been adding extra flights to accommodate an unprecedented amount of cargo, expect the heavy volume to continue through November. •PNA American World Airways will operate an extra freight section each

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In a joint expedition by the Bureau of Mines of Science, the University of Alaska, and the University of Alaska, the 10,000 lb. cargo of the University of Alaska was loaded and shipped in June and July of 1952.

The expedition was led by Dr. Fred L. Smith, Jr., of the University of Alaska. The expedition was equipped with FEDERAL WHEEL-SKIS, which enabled the expedition to transport equipment and supplies to the expedition's base located at the Barrow, Alaska.

Federal Aircraft Works, Inc., of Farmingdale, New York, designed and built the Federal Wheel-Skis, which were used to transport the expedition's equipment and supplies to the expedition's base.

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Shown here and through courtesy of the Bureau of Mines, Division of Alaska, and the University of Alaska, the Federal Wheel-Skis, which were used to transport the expedition's equipment and supplies to the expedition's base.



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work the south to Kentucky, Texas and Florida, will continue this extra service through November of volume month.

• Alaska Airlines, which had to cease its Alaska passenger service while it evolved its place, has lost C-46 transports on its overnight service from Portland, Ore., and Seattle to Fairbanks and Anchorage. It hoped to resume passenger service before the end of the month.

• Northwest Airlines had a 10,000-lb. loading at one time but advised extra freighter flights to whittle it down. It has added a combination passenger-freighter flight to its Alaska schedule, increasing its Alaska freight potential to 20,000 lb. a day on its regular flights. In addition, it is operating a DC-4 freighter daily to the Interior.

• Pacific Northern Airlines, which recently inaugurated scheduled service to Anchorage, is carrying capacity freight loads on its passenger planes, would add extra services if it had the equipment. • Air Transport Association, Seattle, which ordered out of business by CAB, sends one C-46 northward each night, reports it receives requests to handle from 25,000 to 27,000 lb. daily but can handle only 4,000.

## Avianca's Claim: First in Freight

(McGraw-Hill World News)

Regio-Avianca, the Colombian airline, reports its claim to be the first cargo in the carriage of air freight and cargo, maintaining at the same time that it had not been surpassed on a volume basis by any schedule in non-schedule air cargo since December, 1949.

From Jan. 1 to June 30 of this year the carrier transported a total of 11,732,165 lb. of various cargo in scheduled operations, of which 91% moved over Avianca's domestic lines within Colombia. This gives a monthly average of over ten million pounds at a sustained daily average of 170 tons per day, an increase of 51% over the same period last year.

While cargo accounted for 93% of the total Avianca bill, revenue from cargo operations was less than 33% of gross income. Income from freight operations worked out at 26 cents per ton mile.

Of Avianca's total bill of 43 aircraft, 34 is employed exclusively in freight operations. Included are two C-54s, five C-46s and seven C-47s. Each type of aircraft accounted for about the same tonnage during the period, with the two C-54s holding a slight lead; load factor on this type of aircraft for the six months was 41%.

## Materials for Civil Air Production

(DPA Materials to NPA\* for Aircraft Production, First Quarter, 1952)

| Civil Planes               | Military and Civil First Equip | Total Aircraft "B" Products |
|----------------------------|--------------------------------|-----------------------------|
| Carbon steel, tons         | 235                            | 2,675                       |
| Alloy steel, "A" tons      | 3.2                            | 7,099                       |
| Stainless, 1,000 lb.       | 475                            | 1,725                       |
| Wire and copper, 1,000 lb. | 68                             | 757                         |
| Rum and copper, 1,000 lb.  | 52                             | 161                         |
| Fluxing copper, 1,000 lb.  | 69                             | 776                         |
| Aluminum, 1,000 lb.        | 4,999                          | 2,931**                     |
|                            |                                | 7,509**                     |

\* National Production Authority's Aircraft division distributes CMP materials for all vehicle civil aircraft and its both military and civil aircraft equipment. These are all called "Aircraft B Products." Equipment includes landing gear, brakes, pumps, hydraulic systems, engine harness, engine control, fuel systems and other components.

\*\* Defense Production Administration allowed only 6 million lb. also exempt, but NPA allowed another 1.5 million lb. from a reserve.

## Civil Production Pinch Is Eased

DPA approves first quarter materials requests; yearly rate set at 200 transports, 3,500 light planes.

Civil aircraft makers are set to receive "full requirements" of aluminum, copper and steel to meet delivery schedules on transport and accessory planes the first quarter of 1952. This is the word that National Production Authority's Aircraft division passed along to the industry last week, quieting claims of continued shortages.

In the first solid indication that Defense Production Administration will support continued production of civil aircraft and aircraft at approved levels throughout the reported materials shortage of 1952 (Aeronautics News Oct. 5, p. 7071), the DPA has approved civil aircraft production at a rate of 1,500 small planes per year and, so far, 51 transports last half quarter of 1951, 206 transports all next year and 114 in 1952.

The delivery schedules shown on page 50 are first orders already approved by the DPA. The materials allocations DPA has put made to the manufacturers to complete the planes shown as scheduled first quarter, 1952, deliveries and to continue construction and assembly on those shown set for delivery thereafter.

The schedule shown on the Air Coordinating Committee C-4 program approved first quarter.

Next quarter a new AC-C-4 program will come up for DPA approval. It will include new orders such as American Airlines' 30 more DC-6s and DC-6As placed since August and to be approved for the maintenance program by the aircraft agencies and by DPA.

Ultimately, there will be about 200 transports ordered for 1952 delivery, the services has estimated for maintenance authorization. That includes 114 planes shown as already approved by 1951 delivery, about 162 U.S. military orders either placed since August, or ready to go, an estimated 25 unapproved foreign military orders for U.S. plants.

The transports already expected in order for 1952 delivery include some Martin 4-0-4s, Cessna-Lear, Lockheed Super Constellation, and Douglas DC-4s and DC-6s.

All told, civil aviation manufacturers authorize expect delivery of about 10 transports this quarter, 200 small civil and about 300 in 1952. Changing volume requirements in engines and parts supply may, of course, modify the city rate.

Glenn Parfitt-Tall controls requirements to meet the approved civil plane schedule the first quarter were approved, DPA officials say. Because the materials requests were "fully explained and justified" by the elements and "appear accurate."

But DPA officials cut the materials allocations requested for military aircraft equipment and components after 1. Approval of element explanation and justification, 2. Survey of existing inventories, and, 3. Allowance for "leapfrog" for previously-estimated first-quarter production schedules that to lagging engine deliveries and certain other bottlenecks.

DPA cautions that the cut in first quarter controlled materials elements

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## New Transports on Order and Schedule of Delivery

[illegible]

requested for military plane "B" production will not cause any cut in production of military planes.

So, although DPA made cuts of from 11 to 33% in materials allowances asked for by the NPA Aircraft division, DPA officials specified that none of the cut should apply to the proportion of materials asked by civil aircraft. Instead, the aircraft equipment requires more (about 95% of which was shared by the military) should take the whole cut, DPA insisted.

• **Add for Civil Air—**Item the full engine, airframe, propeller and engine production requirements for controlled materials do not compare with materials requirements for B Product components of military planes. Only aluminum and brass rail copper needs of whole engines for the first quarter are greater than the allotment of the next material rule for "B" product aircraft components, of which about 95% are military planes.

The two offices primarily responsible for creating and justifying civil aircraft materials requirements to meet DPA approved production schedule are the NFA Aircraft Division and the CAA Office of Aviation Release Requirements. Also putting in are the Air Coordinating Committee, Under Secretary of Commerce's office, Civil Aviation Board, Office of International Trade and Economic Cooperation Administration.

## CAB Says Stall Caused MCA Crash

Probable cause of the Mid-Continent Airlines DC-7 crash on Mar. 2 at Sioux City, was "a stall during a left turn too close to the ground to effect recovery," the Civil Aeronautics Board says.

The CAB also believes "light ice may have been a factor in this accident causing the aircraft to stall at a slightly higher than normal air speed."

Weather was 300-ft ceiling and one mi. visibility, the approved maximum.

The first approach to Runway 13 had been abandoned, a second approach, this time to Runway 17, was being attempted by the pilot through visual reference to the ground. The aircraft crashed only 600 ft from the end of Runway 17. Survivors and ground witnesses reported hearing a substantial surge of power just before the crash occurred.

They said the plane was in a left turn, the left wing suddenly went down, the plane shuddered, left power was applied but the plane was low and did not recover from the winglow attitude. It slipped into the ground on the left wing. Sixteen of the 22 aboard were killed.

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## Alaskan Asks CAB For Jetliner Route

Alaska Airlines, operator of three DC-4s and three DC-3s, has asked the Civil Aeronautics Board for permission to operate jet services from Fairbanks, Alaska, over the North Pole to Europe. The airline is thinking of the year 1950 or later, depending on jet transport development and on the international situation.

The airline asks permission to fly regular air transport from Fairbanks to Paris via Oslo and London.

Earlier this year, President Truman awarded a CAB route denying Alaska's request for route extensions from Alaska to Seattle/Portland.

Meanwhile, Col. Robert Baldwin, pioneer flyer recently with the Alaskan Air Command, has told the American Society of Civil Engineers that even special planes as a life, you will be flying over the top of the world on routine passenger service between the West Coast and Europe. Special experimental and emergency aircraft operations will be needed for commercial operations, he says. But he pointed out that polar flights are being made by military planes.

## SHORTLINES

► Air Lines, Irish Government airline, plans to buy larger planes than its present DC-3s. It has test series officials to the U. S. to study U. S. airline equipment and operations. Visits will start up at year's end.

► Air France will move Miami, New York, Houston, Mexico City, and Guadalajara-Monterrey-New York, if CAB approves the reorganization of its routes. Certe G. Henderson.

► Air Line Pilots Assn. is asking CAB to review all previously issued orders from Civil Air Regulations granted airlines on flight operations and maintenance. These should be reviewed "in light of the general emphasis now underway to tighten up on safety," an ALPA spokesman says.

► American Airlines voted payment of the regular quarterly dividend of \$74 cents a share on \$1.50 cumulative per share to holders of record Nov. 15.

► British Overseas Airways is reported considering selling some of its Hindley Park Harrier Indians to a private charter firm. About 26 of the four-

cage transports are in operation on the Alaska route. Reason suggested for sale is replacement by the jet-powered Comet.

► CAB and National Airlines have asked CAB to let them run a mail-plane service Houston-Miami via Indianapolis at New Orleans. CAB also wants CAB to take over routes off its Houston-New Orleans route.

► Civil Aeronautics Board Chairman Donald Nyrop and ATA engineering and maintenance chief, Al W. Dallas, are progressing installation of light conductors on airlines. ATA has tested both the General Electric and the Bendix Instrument Co. units. . . . The stated objective is to determine if air freight changes based on weight without regard to bulk or origin, inasmuch as, documentary, or performance, as alleged by Flying Tiger Line, Black Avian and TWA. Such type freight tests are filed by American, Flight, Tiger and United. CAB suspended its pending investigation.

► Colonial Airlines will contract for its publicity and advertising with an independent firm, former was president, publicist, A. M. Hadden, has left the company.

► Continental Air Lines plans to use

two newly ordered DC-6Bs on the American Airlines interchange from Houston to Los Angeles and San Francisco, when the planes are ordered in 1951.

► Delta Air Lines reports net profit of \$185,000, or 17 cents a share, for the quarter ended Sept. 30, compared with \$217,857 a year ago.

► Eastern Air Lines starts training pilots and ground crews for operation of Super Constellation and Martin 40-6 this month.

► KLM Royal Dutch Airlines has signed an airtel based agreement with Trans-Louis, giving monthly discount on post ticket.

► Miami International Airport has ordered 147 high outdoor, runway lights and 760 taxiway lights, and installed from Lane Material Co. for over 9,000-ft. runway, 5,400-ft. runway extension, and complex taxiway system.

► Military Air Transport Service is preparing for participation of two-cage planes to meet potential needs as U. S. military air transport is stepped-up mobilization. Transcontinental and air transport operations will cut back

two years ago in government emergency days. No new planes of the standard, multi-airfield type have been acquired since.

► MATS gets its new commander, Maj. Gen. Joseph Smith, Nov. 15. Will replace Stratford (C-97) going to Strategic Air Command, with Douglas DC-5As (C-119B).

► O'Hare Airport, Chicago, will get majority of Chicago's scheduled airline traffic when and if programmed construction is finished, "provided that satisfactory contracts as to the use of that airport can be worked out between the airlines and the city," says coordinator of representatives of airlines serving Chicago.

► Pan American-Casco Airways has CAB show cause order for temporary end pay rate of 50 cents a seat mile, retroactive to Oct. 1.

► Seaboard and Western Airlines DC-4 has moved from 1,000 to 135 per cent to Transient Company, from Western Air, Mass., in single flight under Air Force contract.

► Transcon Air Lines first month to begin 40 Indianapolis as orders to base service after year's military flight time

ing by Transcon under contract from the Indianapolis government. Transcon will give increasing 20 seats an advanced contract to become flight situation.

► Trans World Airlines revenue passenger miles for Sept. 30 are up 10.8% over a year ago, to 1,415,184,000. Cargo ton miles are up 25.5% to 34,167,000.

► Undersecretary for Transportation office will have ready an outline of the airline and risk statement program this week. Chief architects are Air Coordinating Committee executive secretary Charles Gray and Commerce Undersecretary Denis Ruffalo's executive assistant, R. B. Kerner.

► United Air Lines has ordered two new Douglas DC-6Bs. That makes 22 of the 18-passenger planes for United, including some delivered. Delivery is scheduled for 1952 and 1953.

► U.S. Airlines has signed an airtel agreement to carry air freight for Pan American and Transcon on its eastern U. S. north-south route. The opened a recovery system for freight as scheduled used by Black Avian at Midway Airport, N. Y.



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1953-1954-1955-1956-1957-1958-1959-1960-1961-1962-1963-1964-1965-1966-1967-1968-1969-1970-1971-1972-1973-1974-1975-1976-1977-1978-1979-1980-1981-1982-1983-1984-1985-1986-1987-1988-1989-1990-1991-1992-1993-1994-1995-1996-1997-1998-1999-2000-2001-2002-2003-2004-2005-2006-2007-2008-2009-2010-2011-2012-2013-2014-2015-2016-2017-2018-2019-2020-2021-2022-2023-2024-2025-2026-2027-2028-2029-2030-2031-2032-2033-2034-2035-2036-2037-2038-2039-2040-2041-2042-2043-2044-2045-2046-2047-2048-2049-2050-2051-2052-2053-2054-2055-2056-2057-2058-2059-2060-2061-2062-2063-2064-2065-2066-2067-2068-2069-2070-2071-2072-2073-2074-2075-2076-2077-2078-2079-2080-2081-2082-2083-2084-2085-2086-2087-2088-2089-2090-2091-2092-2093-2094-2095-2096-2097-2098-2099-2100-2101-2102-2103-2104-2105-2106-2107-2108-2109-2110-2111-2112-2113-2114-2115-2116-2117-2118-2119-2120-2121-2122-2123-2124-2125-2126-2127-2128-2129-2130-2131-2132-2133-2134-2135-2136-2137-2138-2139-2140-2141-2142-2143-2144-2145-2146-2147-2148-2149-2150-2151-2152-2153-2154-2155-2156-2157-2158-2159-2160-2161-2162-2163-2164-2165-2166-2167-2168-2169-2170-2171-2172-2173-2174-2175-2176-2177-2178-2179-2180-2181-2182-2183-2184-2185-2186-2187-2188-2189-2190-2191-2192-2193-2194-2195-2196-2197-2198-2199-2200-2201-2202-2203-2204-2205-2206-2207-2208-2209-2210-2211-2212-2213-2214-2215-2216-2217-2218-2219-2220-2221-2222-2223-2224-2225-2226-2227-2228-2229-2230-2231-2232-2233-2234-2235-2236-2237-2238-2239-2240-2241-2242-2243-2244-2245-2246-2247-2248-2249-2250-2251-2252-2253-2254-2255-2256-2257-2258-2259-2260-2261-2262-2263-2264-2265-2266-2267-2268-2269-2270-2271-2272-2273-2274-2275-2276-2277-2278-2279-2280-2281-2282-2283-2284-2285-2286-2287-2288-2289-2290-2291-2292-2293-2294-2295-2296-2297-2298-2299-2300-2301-2302-2303-2304-2305-2306-2307-2308-2309-2310-2311-2312-2313-2314-2315-2316-2317-2318-2319-2320-2321-2322-2323-2324-2325-2326-2327-2328-2329-2330-2331-2332-2333-2334-2335-2336-2337-2338-2339-2340-2341-2342-2343-2344-2345-2346-2347-2348-2349-2350-2351-2352-2353-2354-2355-2356-2357-2358-2359-2360-2361-2362-2363-2364-2365-2366-2367-2368-2369-2370-2371-2372-2373-2374-2375-2376-2377-2378-2379-2380-2381-2382-2383-2384-2385-2386-2387-2388-2389-2390-2391-2392-2393-2394-2395-2396-2397-2398-2399-2400-2401-2402-2403-2404-2405-2406-2407-2408-2409-2410-2411-2412-2413-2414-2415-2416-2417-2418-2419-2420-2421-2422-2423-2424-2425-2426-2427-2428-2429-2430-2431-2432-2433-2434-2435-2436-2437-2438-2439-2440-2441-2442-2443-2444-2445-2446-2447-2448-2449-2450-2451-2452-2453-2454-2455-2456-2457-2458-2459-2460-2461-2462-2463-2464-2465-2466-2467-2468-2469-2470-2471-2472-2473-2474-2475-2476-2477-2478-2479-2480-2481-2482-2483-2484-2485-2486-2487-2488-2489-2490-2491-2492-2493-2494-2495-2496-2497-2498-2499-2500-2501-2502-2503-2504-2505-2506-2507-2508-2509-2510-2511-2512-2513-2514-2515-2516-2517-2518-2519-2520-2521-2522-2523-2524-2525-2526-2527-2528-2529-2530-2531-2532-2533-2534-2535-2536-2537-2538-2539-2540-2541-2542-2543-2544-2545-2546-2547-2548-2549-2550-2551-2552-2553-2554-2555-2556-2557-2558-2559-2560-2561-2562-2563-2564-2565-2566-2567-2568-2569-2570-2571-2572-2573-2574-2575-2576-2577-2578-2579-2580-2581-2582-2583-2584-2585-2586-2587-2588-2589-2590-2591-2592-2593-2594-2595-2596-2597-2598-2599-2600-2601-2602-2603-2604-2605-2606-2607-2608-2609-2610-2611-2612-2613-2614-2615-2616-2617-2618-2619-2620-2621-2622-2623-2624-2625-2626-2627-2628-2629-2630-2631-2632-2633-2634-2635-2636-2637-2638-2639-2640-2641-2642-2643-2644-2645-2646-2647-2648-2649-2650-2651-2652-2653-2654-2655-2656-2657-2658-2659-2660-2661-2662-2663-2664-2665-2666-2667-2668-2669-2670-2671-2672-2673-2674-2675-2676-2677-2678-2679-2680-2681-2682-2683-2684-2685-2686-2687-2688-2689-2690-2691-2692-2693-2694-2695-2696-2697-2698-2699-2700-2701-2702-2703-2704-2705-2706-2707-2708-2709-2710-2711-2712-2713-2714-2715-2716-2717-2718-2719-2720-2721-2722-2723-2724-2725-2726-2727-2728-2729-2730-2731-2732-2733-2734-2735-2736-2737-2738-2739-2740-2741-2742-2743-2744-2745-2746-2747-2748-2749-2750-2751-2752-2753-2754-2755-2756-2757-2758-2759-2760-2761-2762-2763-2764-2765-2766-2767-2768-2769-2770-2771-2772-2773-2774-2775-2776-2777-2778-2779-2780-2781-2782-2783-2784-2785-2786-2787-2788-2789-2790-2791-2792-2793-2794-2795-2796-2797-2798-2799-2800-2801-2802-2803-2804-2805-2806-2807-2808-2809-2810-2811-2812-2813-2814-2815-2816-2817-2818-2819-2820-2821-2822-2823-2824-2825-2826-2827-2828-2829-2830-2831-2832-2833-2834-2835-2836-2837-2838-2839-2840-2841-2842-2843-2844-2845-2846-2847-2848-2849-2850-2851-2852-2853-2854-2855-2856-2857-2858-2859-2860-2861-2862-2863-2864-2865-2866-2867-2868-2869-2870-2871-2872-2873-2874-2875-2876-2877-2878-2879-2880-2881-2882-2883-2884-2885-2886-2887-2888-2889-2890-2891-2892-2893-2894-2895-2896-2897-2898-2899-2900-2901-2902-2903-2904-2905-2906-2907-2908-2909-2910-2911-2912-2913-2914-2915-2916-2917-2918-2919-2920-2921-2922-2923-2924-2925-2926-2927-2928-2929-2930-2931-2932-2933-2934-2935-2936-2937-2938-2939-2940-2941-2942-2943-2944-2945-2946-2947-2948-2949-2950-2951-2952-2953-2954-2955-2956-2957-2958-2959-2960-2961-2962-2963-2964-2965-2966-2967-2968-2969-2970-2971-2972-2973-2974-2975-2976-2977-2978-2979-2980-2981-2982-2983-2984-2985-2986-2987-2988-2989-2990-2991-2992-2993-2994-2995-2996-2997-2998-2999-3000-3001-3002-3003-3004-3005-3006-3007-3008-3009-3010-3011-3012-3013-3014-3015-3016-3017-3018-3019-3020-3021-3022-3023-3024-3025-3026-3027-3028-3029-3030-3031-3032-3033-3034-3035-3036-3037-3038-3039-3040-3041-3042-3043-3044-3045-3046-3047-3048-3049-3050-3051-3052-3053-3054-3055-3056-3057-3058-3059-3060-3061-3062-3063-3064-3065-3066-3067-3068-3069-3070-3071-3072-3073-3074-3075-3076-3077-3078-3079-3080-3081-3082-3083-3084-3085-3086-3087-3088-3089-3090-3091-3092-3093-3094-3095-3096-3097-3098-3099-3100-3101-3102-3103-3104-3105-3106-3107-3108-3109-3110-3111-3112-3113-3114-3115-3116-3117-3118-3119-3120-3121-3122-3123-3124-3125-3126-3127-3128-3129-3130-3131-3132-3133-3134-3135-3136-3137-3138-3139-3140-3141-3142-3143-3144-3145-3146-3147-3148-3149-3150-3151-3152-3153-3154-3155-3156-3157-3158-3159-3160-3161-3162-3163-3164-3165-3166-3167-3168-3169-3170-3171-3172-3173-3174-3175-3176-3177-3178-3179-3180-3181-3182-3183-3184-3185-3186-3187-3188-3189-3190-3191-3192-3193-3194-3195-3196-3197-3198-3199-3200-3201-3202-3203-3204-3205-3206-3207-3208-3209-3210-3211-3212-3213-3214-3215-3216-3217-3218-3219-3220-3221-3222-3223-3224-3225-3226-3227-3228-3229-3230-3231-3232-3233-3234-3235-3236-3237-3238-3239-3240-3241-3242-3243-3244-3245-3246-3247-3248-3249-3250-3251-3252-3253-3254-3255-3256-3257-3258-3259-3260-3261-3262-3263-3264-3265-3266-3267-3268-3269-3270-3271-3272-3273-3274-3275-3276-3277-3278-3279-3280-3281-3282-3283-3284-3285-3286-3287-3288-3289-3290-3291-3292-3293-3294-3295-3296-3297-3298-3299-3300-3301-3302-3303-3304-3305-3306-3307-3308-3309-3310-3311-3312-3313-3314-3315-3316-3317-3318-3319-3320-3321-3322-3323-3324-3325-3326-3327-3328-3329-3330-3331-3332-3333-3334-3335-3336-3337-3338-3339-3340-3341-3342-3343-3344-3345-3346-3347-3348-3349-3350-3351-3352-3353-3354-3355-3356-3357-3358-3359-3360-3361-3362-3363-3364-3365-3366-3367-3368-3369-3370-3371-3372-3373-3374-3375-3376-3377-3378-3379-3380-3381-3382-3383-3384-3385-3386-3387-3388-3389-3390-3391-3392-3393-3394-3395-3396-3397-3398-3399-3400-3401-3402-3403-3404-3405-3406-3407-3408-3409-3410-3411-3412-3413-3414-3415-3416-3417-3418-3419-3420-3421-3422-3423-3424-3425-3426-3427-3428-3429-3430-3431-3432-3433-3434-3435-3436-3437-3438-3439-3440-3441-3442-3443-3444-3445-3446-3447-3448-3449-3450-3451-3452-3453-3454-3455-3456-3457-3458-3459-3460-3461-3462-3463-3464-3465-3466-3467-3468-3469-3470-3471-3472-3473-3474-3475-3476-3477-3478-3479-3480-3481-3482-3483-3484-3485-3486-3487-3488-3489-3490-3491-3492-3493-3494-3495-3496-3497-3498-3499-3500-3501-3502-3503-3504-3505-3506-3507-3508-3509-3510-3511-3512-3513-3514-3515-3516-3517-3518-3519-3520-3521-3522-3523-3524-3525-3526-3527-3528-3529-3530-3531-3532-3533-3534-3535-3536-3537-3538-3539-3540-3541-3542-3543-3544-3545-3546-3547-3548-3549-3550-3551-3552-3553-3554-3555-3556-3557-3558-3559-3560-3561-3562-3563-3564-3565-3566-3567-3568-3569-3570-3571-3572-3573-3574-3575-3576-3577-3578-3579-3580-3581-3582-3583-3584-3585-3586-3587-3588-3589-3590-3591-3592-3593-3594-3595-3596-3597-3598-3599-3600-3601-3602-3603-3604-3605-3606-3607-3608-3609-3610-3611-3612-3613-3614-3615-3616-3617-3618-3619-3620-3621-3622-3623-3624-3625-3626-3627-3628-3629-3630-3631-3632-3633-3634-3635-3636-3637-3638-3639-3640-3641-3642-3643-3644-3645-3646-3647-3648-3649-3650-3651-3652-3653-3654-3655-3656-3657-3658-3659-3660-3661-3662-3663-3664-3665-3666-3667-3668-3669-3670-3671-3672-3673-3674-3675-3676-3677-3678-3679-3680-3681-3682-3683-3684-3685-3686-3687-3688-3689-3690-3691-3692-3693-3694-3695-3696-3697-3698-3699-3700-3701-3702-3703-3704-3705-3706-3707-3708-3709-3710-3711-3712-3713-3714-3715-3716-3717-3718-3719-3720-3721-3722-3723-3724-3725-3726-3727-3728-3729-3730-3731-3732-3733-3734-3735-3736-3737-3738-3739-3740-3741-3742-3743-3744-3745-3746-3747-3748-3749-3750-3751-3752-3753-3754-3755-3756-3757-3758-3759-3760-3761-3762-3763-3764-3765-3766-3767-3768-3769-3770-3771-3772-3773-3774-3775-3776-3777-3778-3779-3780-3781-3782-3783-3784-3785-3786-3787-3788-3789-3790-3791-3792-3793-3794-3795-3796-3797-3798-3799-3800-3801-3802-3803-3804-3805-3806-3807-3808-3809-3810-3811-3812-3813-3814-3815-3816-3817-3818-3819-3820-3821-3822-3823-3824-3825-3826-3827-3828-3829-3830-3831-3832-3833-3834-3835-3836-3837-3838-3839-3840-3841-3842-3843-3844-3845-3846-3847-3848-3849-3850-3851-3852-3853-3854-3855-3856-3857-3858-3859-3860-3861-3862-3863-3864-3865-3866-3867-3868-3869-3870-3871-3872-3873-3874-3875-3876-3877-3878-3879-3880-3881-3882-3883-3884-3885-3886-3887-3888-3889-3890-3891-3892-3893-3894-3895-3896-3897-3898-3899-3900-3901-3902-3903-3904-3905-3906-3907-3908-3909-3910-3911-3912-3913-3914-3915-3916-3917-3918-3919-3920-3921-3922-3923-3924-3925-3926-3927-3928-3929-3930-3931-3932-3933-3934-3935-3936-3937-3938-3939-3940-3941-3942-3943-3944-3945-3946-3947-3948-3949-3950-3951-3952-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## FOUR MORE RECORDS FALL TO G-E JETS

**Thompson Trophy:** A North American F-86 smashed the world's speed record for the 100-kilometer closed-course with a speed of 628.698. In warming up for the event, the jet also broke the closed-course record with a speed of 635.411.

**Bendix Trophy:** Another Sabrejet beat existing Muroc-to-Detroit records in winning the Bendix race with a speed of 553.761—averaging better than 25 mph faster than the previous record. The F-86 finished the race in a dive at sonic speed, after sustaining speeds of better than 650 mph over much of the course.

**Chicago to Detroit:** Four F-86s, averaging 672.189 mph, etched a new record in the skies from Chicago to Detroit, finishing the 237-mile course in less than 21 minutes.

|                              |                    |
|------------------------------|--------------------|
| <b>Thompson Trophy:</b>      | <b>628.698 MPH</b> |
| <b>Closed-course Record:</b> | <b>635.411 MPH</b> |
| <b>Bendix Race:</b>          | <b>553.61 MPH</b>  |
| <b>Chicago to Detroit:</b>   | <b>21 minutes</b>  |

Shattering existing records in every event in which they were entered, North American F-86 Sabrejets, powered by General Electric J47 jet engines, tallied a clean sweep at the National Air Races in Detroit.

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